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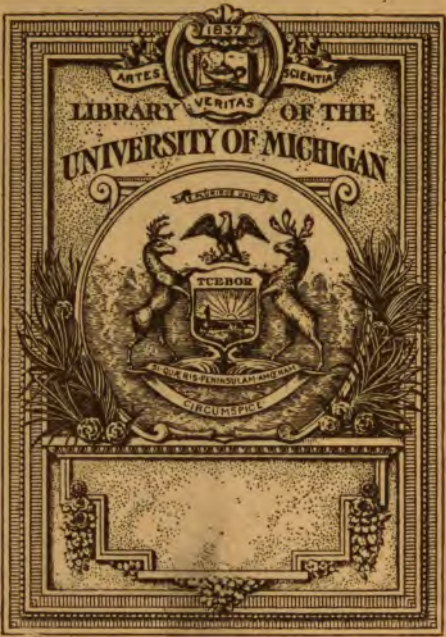

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A
SYSTEM
OF
GEOMETRY AND TRIGONOMETRY:

TOGETHER WITH A

TREATISE ON SURVEYING;

TEACHING VARIOUS WAYS OF TAKING THE SURVEY OF A FIELD;
ALSO TO PROTRACT THE SAME AND FIND THE AREA.

LIKEWISE,

RECTANGULAR SURVEYING;

OR,

AN ACCURATE METHOD OF CALCULATING THE AREA OF ANY FIELD
ARITHMETICALLY, WITHOUT THE NECESSITY OF PLOTTING IT.

TO THE WHOLE ARE ADDED

SEVERAL MATHEMATICAL TABLES,

NECESSARY FOR SOLVING QUESTIONS IN

TRIGONOMETRY AND SURVEYING;

WITH A

PARTICULAR EXPLANATION OF THOSE TABLES,
AND THE MANNER OF USING THEM.

FOURTH EDITION,
REVISED AND CORRECTED.

COMPILED FROM VARIOUS AUTHORS,
BY ABEL FLINT, A. M.

HARTFORD:
PUBLISHED BY COOKE & HALE.
....
1818.

DISTRICT OF CONNECTICUT, ss.

L. S.

BE IT REMEMBERED; That on the twenty-fifth day of September, in the forty-third year of the independence of the United States of America, Oliver D. Cooke of the said District hath deposited in this office the title of a Book, the right whereof he claims as Proprietor, in the words following, to wit:

"A System of Geometry and Trigonometry: together with a Treatise on Surveying; teaching various ways of taking the Survey of a Field; also to protract the same and find the area. Likewise, Rectangular Surveying; or, an accurate method of calculating the area of any field arithmetically, without the necessity of plotting it. To the whole are added several Mathematical Tables, necessary for solving questions in Trigonometry and Surveying; with a particular Explanation of those Tables, and the manner of using them. Fourth edition, revised and corrected. Compiled from various Authors, by Abel Flint, A. M."

In conformity to the act of the Congress of the United States, entitled, "An act for the encouragement of learning, by securing the copies of Maps, Charts and Books, to the authors and proprietors of such copies, during the times therein mentioned."

R. I. INGERSOLL,
Clerk of the District of Connecticut.

A true copy of Record, examined and sealed by me,

R. I. INGERSOLL,
Clerk of the District of Connecticut.

RECOMMENDATIONS.

HAVING perused, with some attention, the following Treatise on Surveying, in Manuscript, it appears to me to be estimable for its simplicity and perspicuity; and, by excluding all matter but remotely connected with the main subject, and reducing the Tables of Logarithms, of Logarithmic Sines, Tangents and Secants, and of Difference of Latitude and Departure, without impairing their use, in their application to most cases which occur in common Surveying, and supplying any possible defect by a Table of Natural Sines, to comprise, in the limits of a pocket volume, whatever is most essential and most useful in the Art, including the important modern improvement of Rectangular Surveying; and on the whole, particularly from the size of the volume, to be well adapted to general use.

JOHN TREADWELL.

Farmington, Sept. 20th, 1804.

340083

WE the subscribers have carefully persued a Treatise on Surveying, prepared for the Press by the Rev. Abel Flint of Hartford; and find it worthy of the public patronage. Every thing not immediately necessary for the practical Surveyor has been excluded; while it comprises all which is requisite in Field Surveying, both on the old and new plan; elucidated and explained with a degree of conciseness and perspicuity not usually to be found in Treatises on the same subject. The Mathematical Tables are reduced to less than half the size occupied by others; and any inconvenience which might result from such reduction, is obviated by the insertion of a Table of Natural Sines, not usually found in works of this nature. The Surveyor who shall own this will not be under the necessity of purchasing GIBSON, which is a more expensive work.

ASHER MILLER, Surveyor General.
GEORGE GILLET, Deputy Surveyor
for Tolland County.

MIDDLETOWN, OCT. 3, 1804.

PREFACE.

The following work is chiefly a compilation from other Books; and but very little new is added except a more full explanation, than has yet been published, of Rectangular Surveying, or the method of calculating the Area of Fields arithmetically, without drawing a plot of them and measuring with a Scale and Dividers, as has been the common practice; and also a more particular explanation of the use of Natural Sines than is contained in most Mathematical Books.

The Compiler has endeavoured to render this work so easy and intelligible that a Learner will require but little assistance from an Instructor, except with regard to the construction and use of Mathematical and Surveying instruments. Before, however, he enters on the study of this Book he must be well acquainted with common Arithmetic, with Decimal Fractions and the Square Root; and he must also know the various characters or marks used in Arithmetic.

A Surveyor will doubtless find many questions arise in the course of his practice, for the solution of which no particular directions are here given; nor is it possible to give directions for every case that may occur. In all practical Sciences much must be left to the judgment of the practitioner, who, if he is well acquainted with the general principles of his Art, will readily learn to apply those principles to particular cases.

The primary design of this treatise is to teach common Field Surveying; at the same time it contains the elements of Surveying upon a larger scale; and the system of Geometry and Trigonometry with which it is introduced, with the Problems for the mensuration of Superficies, as also the Mathematical Tables at the end, will be found useful for many other purposes. It would be well, therefore, for those who do not intend to become practical Surveyors to acquaint themselves with what is here taught; and with this view the following work is very proper to be introduced into Academies, and those higher Schools which are designed to fit young men for active business in life. Indeed every person who frequently buys and sells land should learn to calculate the Contents of a field arithmetically; a knowledge which may be acquired in a very little time, from the particular explanation here given of that method.

Notwithstanding the many Books already published on the subjects here treated upon, it was thought a work of this kind was really wanted, and that if judiciously executed it would be useful. It is more particularly necessary at the present time in Connecticut, as the Legislature of the State have lately enacted a Law on the subject of Surveying, in consequence of which more attention must be paid to the Theory of that Art than has been common.

These considerations induced the Compiler to select from various publications what appeared to him important; and to arrange the whole in a method best adapted, in his view, for teaching that useful Art. How far he has succeeded in his endeavours to simplify the subject, and render it easy to the Learner, must be submitted to the test of experience.

HARTFORD, Con. October, 1804.

A GENERAL VIEW OF THE CONTENTS OF THIS WORK.

The System of Geometry is divided into two parts. The first contains Geometrical Definitions respecting Lines, Angles, Superficies, &c. The second part contains a number of Geometrical Problems necessary for Trigonometry and Surveying.

The System of Trigonometry is also divided into two parts: and teaches the solution of questions in Right and Oblique angled Trigonometry, by Logarithms and also by Natural Sines.

The Treatise on Surveying is divided into three parts. Part first treats of measuring Land, and is divided into three Sections. The first contains several Problems respecting Mensuration, and for finding the Area of various Right-lined Figures and Circles.

The second Section teaches different methods of taking the Survey of fields; also to protract them, and find their Area in the manner commonly practised, and likewise by Arithmetical and Trigonometrical calculations, without measuring Diagonals and Perpendiculars with a Scale and Dividers; interspersed with sundry useful rules and directions.

The third Section is a particular explanation and demonstration of *Rectangular Surveying*, or the method of computing the Area of fields from the Field Notes, by Mathematical Tables, without the necessity of plotting the Field. To this Section is added a useful Problem for ascertaining the true Area of a Field which has been measured by a Chain too long or too short.

Part second treats of laying out Land in various shapes.

Part third contains sundry Problems and Rules for dividing Land and determining the true Course and Distance of dividing Lines, or from one part of a Field to another. To this is added an Appendix concerning the Variation of the Compass and Attraction of the Needle; also, a rule to find the difference between the present Variation, and that at a time when a Tract was formerly surveyed, in order to trace or run out the original lines.

The Mathematical Tables, are A Traverse Table, or Table of Difference of Latitude and Departure, calculated for every Degree and quarter of a Degree, and for any distance up to 50; a Table of Natural Sines calculated for every Minute; a Table of Logarithms comprised in four pages, yet sufficiently extensive for common use; and a Table of Logarithmic or Artificial Sines, Tangents and Secants, calculated for every 5 Minutes of a Degree. To these Tables are prefixed particular explanations of the manner of using them.

GEOMETRY.

GEOMETRY is a Science which treats of the properties of Magnitude.

PART I.

Geometrical Definitions.

1. A Point is a small Dot; or, Mathematically considered, is that which has no parts, being of itself indivisible.

2. A Line has length but no breadth.

3. A Superficies or Surface, called also Area, has length and breadth, but no thickness.

4. A Solid has length, breadth and thickness.

5. A Right Line is the shortest that can be drawn between two Points.

6. The inclination of two Lines meeting one another, or the opening between them, is called an Angle. Thus at B. PLATE I. *Figure* 1. is an Angle, formed by the meeting of the Lines AB and BC.

7. If a right Line CD. *Fig.* 2. fall upon another Right Line AB, so as to incline to neither side, but make the Angles on each side equal, then those Angles are called Right Angles; and the Line CD is said to be Perpendicular to the other Line.

8. An Obtuse Angle is greater than a Right Angle; as ADE. *Fig.* 3.

9. An Acute Angle is less than a Right Angle; as EDB. *Fig.* 3.

Note. When three letters are used to express an Angle, the middle letter denotes the angular Point.

10. A Circle is a round Figure, bounded by a Line equally distant from some Point, which is called the Centre. *Fig.* 4.

11. The Circumference or Periphery of a Circle is the bounding Line; as ADEB. *Fig.* 4.

12. The Radius of a Circle is a Line drawn from the Centre to the Circumference; as CB. *Fig.* 4. Therefore all Radii of the same Circle are equal.

13. The Diameter of a Circle is a Right Line drawn from one side of the Circumference to the other, passing through the Centre; and it divides the Circle into two equal parts, called Semicircles; as AB or DE. *Fig* 5.

14. The Circumference of every Circle is supposed to be divided into 360 equal parts, called Degrees; and each Degree into 60 equal parts, called Minutes; and each Minute into 60 equal parts, called Seconds; and these into Thirds, &c.

Note. Since all Circles are divided into the same number of Degrees, a Degree is not to be accounted a quantity of any determinate length, as so many inches or Feet, &c. but is always to be reckoned as being the 360th part of the Circumference of any Circle, without regarding the bigness of the Circle.

15. An Arch or Arc of a Circle is any part of the Circumference; as BF or FD. *Fig.* 5; and is said to be an Arch of so many Degrees as it contains parts of 360 into which the whole Circle is divided.

16. A Chord is a Right Line drawn from one end of an Arch to the other, and is the measure of the Arch; as HG is the Chord of the Arch HIG. *Fig.* 6.

Note. The Chord of an Arch of 60 degrees is equal in length to the Radius of the Circle of which the Arch is a part.

17. The Segment of a Circle is a part of a Circle, cut off by a Chord; thus the space comprehended between the Arch HIG and the Chord HG is called a Segment. *Fig.* 6.

18. A Quadrant is one quarter of a Circle; as ACB. *Fig.* 6.

19. A Sector of a Circle is a space contained between two Radii and an Arch less than a Semicircle; as BCD or ACD. *Fig.* 6.

20. The Sine of an Arch is a Line drawn from one end of the Arch, perpendicular to the Radius or Diameter drawn through the other end: Or, it is half the Chord of double the Arch; thus HL is the Sine of the Arch HB, *Fig.* 7.

21. The Sines on the same Diameter increase in length till they come to the Centre, and so become the Radius. Hence it is plain that the Radius CD *Fig.* 7. is the greatest possible Sine, or Sine of 90 Degrees.

22. The Versed Sine of an Arch is that part of the Diameter or Radius which is between the Sine and the Circumference; thus LB is the Versed Sine of the Arch HB. *Fig.* 7.

23. The Tangent of an Arch is a Right Line touching the Circumference, and drawn perpendicular to the Diameter; and is terminated by a Line drawn from the Centre through the other end of the Arch; thus BK is the Tangent of the Arch BH. *Fig.* 7.

Note. The Tangent of an Arch of 45 Degrees is equal in length to the Radius of the Circle of which the Arch is a part.

24. The Secant of an Arch is a Line drawn from the Centre through one end of the Arch till it meets the Tangent; thus CK is the Secant of the Arch BH. *Fig.* 7.

25. The Complement of an Arch is what the Arch wants of 90 Degrees, or a Quadrant; thus HD is the Complement of the Arch BH. *Fig.* 7.

26. The Supplement of an Arch is what the Arch wants of 180 Degrees, or a Semicircle; thus ADH is the Supplement of the Arch BH. *Fig.* 7.

27. The Sine, Tangent or Secant of the Complement of any Arch is called the Co-Sine, Co-Tangent or Co-Secant of the Arch; thus FH is the Sine, DI the Tangent and CI the Secant of the Arch DH; or they are the Co-Sine, Co-Tangent and Co-Secant of the Arch BH. *Fig.* 7.

28. The measure of an Angle is the Arch of a Circle contained between the two Lines which form the Angle, the angular Point being the Centre; thus the Angle HCB. *Fig.* 7. is measured by the Arch BH: and is said to contain so many Degrees as the Arch does.

Note. An Angle is esteemed greater or less according to the opening of the Lines which form it, or as the Arch intercepted by those Lines contains more or fewer Degrees. Hence it may be observed, that the bigness of an Angle does not depend at all upon the length of the including Lines; for all Arches described on the same Point, and intercepted by the same Right Lines, contain exactly the same number of Degrees, whether the Radius be longer or shorter.

29. The Sine, Tangent or Secant of an Arch is also the Sine, Tangent or Secant of the Angle whose measure the Arch is.

30. Parallel Lines are such as are equally distant from each other; as AB and CD. *Fig.* 8.

31. A Triangle is a Figure bounded by three Lines; as ABC. *Fig.* 9.

32. An Equilateral Triangle has its three sides equal in length to each other. *Fig.* 9.

33. An Isocles Triangle has two of its sides equal, and the other longer or shorter. *Fig.* 10.

34. A Scalene Triangle has three unequal Sides. *Fig.* 11.

35. A Right Angled Triangle has one Right Angle. *Fig.* 12.

36. An Obtuse Angled Triangle has one Obtuse Angle. *Fig.* 13.

37. An Acute Angled Triangle has all its Angles Acute. *Fig.* 9, or 10.

38. Acute and Obtuse Angled Triangles are called Oblique Angled Triangles, or simply Oblique Triangles; in which the bottom Side is generally called the Base and the other two, Legs.

39. In a Right Angled Triangle the longest Side is called the Hypothenuse, and the other two, Legs, or Base and Perpendicular.

> *Note.* The three Angles of every Triangle being added together will amount to 180 Degrees; consequently the two Acute Angles of a Right Angled Triangle amount to 90 Degrees, the Right Angle being also 90.

40. The perpendicular height of a Triangle is a Line drawn from one of the Angles to its opposite Side; thus the dotted Line AD. *Fig.* 14. is the perpendicular height of the Triangle ABC.

> *Note.* This Perpendicular may be drawn from either of the Angles; and whether it falls within the Triangle, or on one of the Lines continued beyond the Triangle, is immaterial.

41. A Square is a Figure bounded by four equal Sides, and containing four Right Angles. *Fig.* 15.

42. A Parallelogram, or Oblong Square, is a Figure bounded by four Sides, the opposite ones being equal and the Angles Right. *Fig.* 16.

43. A Rhombus is a Figure bounded by four equal Sides, but has its Angles Oblique. *Fig.* 17.

44. A Rhomboides is a Figure bounded by four Sides, the opposite ones being equal, but the Angles Oblique. *Fig.* 18.

45. The perpendicular height of a Rhombus or Rhomboides is a Line drawn from one of the Angles to its opposite Side; thus the dotted Lines AB. *Fig.* 17. and *Fig.* 18. represent the perpendicular height of the Rhombus and Rhomboides.

46. A Trapezoid is a Figure bounded by four Sides, two of which are parallel though of unequal lengths. *Fig.* 19. and *Fig.* 20.

> *Note. Fig.* 19. is sometime called a Right Angled Trapezium.

47. A Trapezium is a figure bounded by four unequal Sides. *Fig.* 21.

48. A Diagonal is a Line drawn between two opposite Angles; as the Line AB. *Fig.* 21.

49. Figures which consist of more than four Sides are called Polygons; if the sides are equal to each other they are called regular Polygons, and are sometimes named from the number of their sides, as Pentagon, or Hexagon, a Figure of five or six Sides, &c; if the Sides are unequal they are called irregular Polygons.

◆

PART II.

Geometrical Problems.

PROBLEM I. *To draw a Line parallel to another Line at any given distance; as at the Point D, to make a Line, parallel to the Line AB.* PLATE 1. *Fig.* 22.

With the Dividers take the nearest distance between the Point D and the given Line AB; with that distance set one foot of the Dividers any where on the Line AB, as at E, and draw the Arch C; through the Point D draw a Line so as just to touch the top of the Arch C.

A more convenient way to draw parallel Lines is with a parallel Rule.

PROBLEM II. *To bisect a given Line; or to find the middle of it. Fig.* 23.

Open the Dividers to any convenient distance, more than half the given Line AB, and with one foot in A describe an Arch above and below the Line, as at C and D; with the same distance, and one foot in B describe Arches to cross the former; lay a Rule from C to D, and where the Rule crosses the Line, as at E, will be the middle.

PROBLEM III. *To erect a Perpendicular from the end, or any part of a given Line. Fig.* 24.

Open the Dividers to any convenient distance, as from D to A, and with one foot on the Point D, from which the Perpendicular is to be erected, describe an Arch, as AEG; set off the same distance from A to E and from E to G; upon E and G describe two Arches to intersect each other at H; draw a Line from H to D, and one Line will be perpendicular to the other.

Note. There are other methods of erecting a Perpendicular, but this is the most simple.

PROBLEM IV. *From a given Point, as at C, to drop a Perpendicular on a given Line AB. Fig.* 25.

With one foot of the Dividers in C describe an Arch to cut the given Line in two places, as at F and G; upon F and G describe two Arches to intersect each other below the Line as at D; lay a Rule from C to D and draw a Line from C to the given Line.

Perpendiculars may be more readily raised and let fall, by a small Square made of Brass, Ivory or Wood.

PROBLEM V. *To make an Angle at E, equal to a given Angle ABC. Fig.* 26.

Open the Dividers to any convenient distance, and with one foot in B describe the Arch FG; with the same distance and one foot in E, describe an Arch from H; measure the Arch FG, and lay off the same distance on the Arch from H to I; draw a Line through I to E, and the Angles will be equal.

PROBLEM VI. *To make an Acute Angle equal to a given number of Degrees, suppose* 36. *Fig.* 27.

Draw the Line AB to any convenient length; from a Scale of Chords take 60 Degrees with the Dividers, and with one foot in B describe an Arch from the Line AB; from the same Scale take the given number of Degrees, 36, and lay it on the Arch from C to D; draw a line from B through D, and the Angle at B will be an Angle of 36 Degrees.

PROBLEM VII. *To make an Obtuse Angle, suppose of* 110 *Degrees. Fig.* 28.

Take a Chord of 60 Degrees as before, and describe an Arch greater than a Quadrant; set off 90 Degrees from B to C, and from C to E set off the excess above 90, which is 20; draw a Line from G through E and the Angle will contain 110 Degrees.

> *Note.* In a similar manner Angles may be measured; that is, with a Chord of 60 Degrees describe an Arch on the angular Point, and on a Scale of Chords measure the Arch intercepted by the Lines forming the angle.

A more convenient method of making and measuring Angles is to use a Protractor instead of a Scale and Dividers.

PROBLEM VIII. *To make a Triangle of three given Lines, as* BO, BL, LO. *Fig.* 29.

Draw the Line BL from B to L; from B, with the length of the Line BO, describe an Arch as at O; from L, with the length of the Line LO, describe another Arch to intersect the former; from O draw the Lines OB and OL, and BOL will be the Triangle required.

PROBLEM IX. *To make a Right Angled Triangle, the Hypothenuse and Angles being given. Fig.* 30.

Suppose the Hypothenuse CA 25 Rods or Chains, the angle at C 35° 30′ and consequently the Angle at A 54° 30′. *See Note after the 39th Geometrical Definition.*

> *Note.* When Degrees and Minutes are expressed, they are distinguished from each other by a small Cypher at the right hand of the Degrees, and a Dash at the right hand of the Minutes; thus 35° 30′ is 35 Degrees and 30 Minutes.

Draw the Line CB an indefinite length; at C make an Angle of 35° 30′; through where that number of Degrees cuts the Arch draw the Line CA 25 Rods, which must be taken from some Scale of equal parts;

drop a Perpendicular from A to B, and the Triangle will be completed.

Note. The length of the two Legs may be found by measuring them upon the same scale of equal parts from which the Hypothenuse was taken.

PROBLEM X. *To make a Right Angled Triangle, the Angles and one Leg being given.* *Fig.* 31.

Suppose the Angle at C 33° 15', and the Leg AC 285.

Draw the Leg AC making it in length 285; at A erect a Perpendicular an indefinite length; at C make an Angle of 33° 15'; through where that number of Degrees cuts the Arch draw a Line till it meets the Perpendicular at B.

Note. If the given Line CA should not be so long as the Chord of 60°, it may be continued beyond A, for the purpose of making the Angle.

PROBLEM XI. *To make a Right Angled Triangle, the Hypothenuse and one Leg being given.* *Fig.* 32.

Suppose the Hypothenuse AC 40, and the Leg AB 28.

Draw the Leg AB in length 28; from B erect a Perpendicular an indefinite length; take 40 in the Dividers, and setting one foot in A, wherever the other foot strikes the Perpendicular will be the Point C.

Note. When the Triangle is constructed the Angles may be measured by a Protractor, or by a Scale of Chords.

PROBLEM XII. *To make a Right Angled Triangle, the two Legs being given.* *Fig.* 33.

Suppose the Leg AB 38, and the Leg BC 46.

Draw the Leg AB in length 38; from B erect a Perpendicular to C in length 46; and draw a Line from A to C.

PROBLEM XIII. *To make an Oblique Angled Triangle, the Angles and one Side being given.* *Fig.* 34.

Suppose the side BC 98; the Angle at B 45° 15′, the Angle at D 108° 30′, consequently the other Angle 26° 15′.

Draw the side BC in length 98; on the Point B make an Angle of 45° 15′; on the Point C make an Angle of 26° 15′, and draw the Lines BD and CD.

PROBLEM XIV. *To make an Oblique Angled Triangle, two Sides and an Angle opposite to one of them being given.* *Fig.* 35.

Suppose the Side BC 160, the Side BD 79, and the Angle at C 29° 9′.

Draw the Side BC in length 160; at C make an Angle of 29° 9′, and draw an indefinite Line through where the Degrees cut the Arch; take 79 in the Dividers, and with one foot in B lay the other on the Line CD; the point D will be the other Angle of the Triangle.

PROBLEM XV. *To make an Oblique Angled Triangle, two Sides and their contained Angle being given.* *Fig.* 36.

Suppose the Side BC 109, the Side BD 76, and the Angle at B 101° 30′.

Draw the Side BC in length 109; at B make an Angle of 101° 30′, and draw the Side BD in length 76; draw a Line from D to C and it is done.

PBOBLEM XVI. *To make a Square.* Plate II. *Fig.* 37.

Draw the Line AB the length of the proposed Square; from B erect a Perpendicular to C and make it of the same length as AB; from A and C, with the same distance in the Dividers, describe Arches intersecting each other at D, and draw the Lines AD and DC.

PROBLEM XVII. *To make a Parallelogram.* *Fig.* 38.

Draw the Line AB equal to the longest side of the Parallelogram; on B erect a Perpendicular the length of the shortest side to C; from C, with the longest Side, and from A, with the shortest Side, describe Arches intersecting each other at D, and draw the Lines AD and CD.

PROBLEM XVIII. *To describe a Circle which shall pass through any three given Points, not lying in a Right Line, as* A, B, D. *Fig.* 43.

Draw Lines from A to B and from B to D; bisect those Lines by PROBLEM II. and the Point where the bisecting Lines intersect each other, as at C, will be the Centre of the Circle.

PROBLEM XIX. *To find the centre of a Circle.*

By the last PROBLEM it is plain, that if three Points be any where taken in the given Circle's Periphery, the Centre of the Circle may be found as there taught.

Directions for constructing irregular Figures of four or more sides may be found in the following Treatise on SURVEYING.

TRIGONOMETRY.

TRIGONOMETRY is that part of practical GEOMETRY by which the Sides and Angles of Triangles are measured; whereby three things being given, either all Sides or Sides and Angles, a fourth may be found; either by measuring with a Scale and Dividers, according to the PROBLEMS in GEOMETRY, or more accurately by calculation with Logarithms, or with Natural Sines.

TRIGONOMETRY is divided into two Parts, *Rectangular* and *Oblique-angular.*

PART I.

RECTANGULAR TRIGONOMETRY.

This is founded on the following methods of applying a Triangle to a Circle.

PROPOSITION I. In every Right Angled Triangle, as ABC, PLATE II. *Figure* 44, it is plain from PLATE I. *Fig.* 7. compared with the Geometrical Definitions to which that *Figure* refers, that if the Hypothenuse AC be made Radius, and with it an Arch of a Circle be described from each end, BC will be the Sine of the Angle at A, and AB the Sine of the Angle at C; that is, the Legs will be Sines of their opposite Angles.

PROPOSITION II. If one Leg, AB, *Fig.* 45, be made Radius, and with it on the Point A an Arch be described, then BC, the other Leg, will be the Tangent and AC the Secant of the Angle at A; and if BC be made Radius, and an Arch be described with it on the Point C, then AB will be the Tangent and AC the Secant of the Angle at C; that is, if one Leg be made Radius the other Leg will be a Tangent of its opposite Angle, and the Hypothenuse a Secant of the same Angle.

Thus, as different Sides are made Radius, the other Sides acquire different names, which are either Sines, Tangents or Secants.

As the Sides and Angles of Triangles bear a certain proportion to each other, two sides and one Angle, or one Side and two Angles being given, the other Sides or Angles may be found by instituting Proportions, according to the following Rules.

Rule I. To find a Side either of the Sides may be made Radius, then institute the following Proportion:

As the name of the Side given, which will be either Radius, Sine, Tangent or Secant;
Is to the length of the Side given;
So is the name of the Side required, which also will be either Radius, Sine, Tangent or Secant;
To the length of the Side required.

Rule II. To find an Angle one of the given Sides must be made Radius, then institute the following Proportion;

As the length of the given side made Radius;
Is to its name, that is Radius;
So is the length of the other given Side;
To its name, which will be either Sine, Tangent or Secant.

Having instituted the Proportion, look the corresponding Logarithms, in the Logarithms for numbers for the length of the Sides, and in the Table of Artificial Sines, Tangents and Secants, for the Logarithmic Sine, Tangent or Secant.

Having found the Logarithms of the three given Terms, add together the Log. of the second and third Terms, and from their Sum subtract the Log. of the first Term, the Remainder will be the Log. of the fourth Term, which seek in the Tables and find its corresponding Number or Degrees and Minutes.

See the Introduction to the Table of Logarithms; which should be attentively studied by the Learner before he proceeds any further.

Note. The Logarithm for Radius is always 10, which is the Logarithmic Sine of 90°, and the Logarithmic Tangent of 45°.

The preceding PROPOSITIONS and RULES being duly attended to, the solution of the following CASES of *Rectangular Trigonometry* will be easy.

CASE I.

The Angles and Hypothenuse given to find the Legs. Fig. 39.

In the Triangle ABC, given the Hypothenuse AC 25 Rods or Chains; the Angle at A 35° 30′: and consequently the Angle at C 54° 30′: to find the Legs.

Making the Hypothenuse Radius, the Proportions will be:

To find the Leg AB.		*To find the Leg* BC.	
As Radius - -	10.00000	As Radius - -	10.00000
: Hyp. AC, 25 -	1.39794	: Hyp. AC, 25 -	1.39794
: : Sine ACB, 54° 30′	9.91069	: : Sine CAB, 35° 30′	9.76395
	11.30863		11.16189
	10.00000		10.00000
: Leg AB, 20.35 -	1.30863	: Leg BC, 14.52	1.16189

Note. When the first Term is Radius, it may be Subtracted by cancelling the first figure of the Sum of the other two Terms.

Making the Leg AB Radius, the Proportions will be:

To find the Leg AB.	*To find the Leg* BC.
As Secant CAB, 35° 30′	As Secant CAB, 35° 30′
: Hyp. AC, 25	: Hyp. AC, 25
: : Radius	: : Tangent, CAB, 35° 30′
: Leg AB, 20. 35	: Leg BC, 14.52

Making the Leg BC Radius, the Proportions will be:

To find the Leg AB.	*To find the Leg* BC.
As Secant ABC, 54° 30′	As Secant ACB, 54° 30′
: Hyp. AC, 25	: Hyp. AC, 25
: : Tangent ACB, 54° 30′	: : Radius
: Leg AB, 20.35	: Leg. BC, 14.52

The Logarithms of the four last Proportions being looked out, and added and subtracted according to the Rule, the result will be found to be the same as the two first Proportions.

◆

By Natural Sines.

This Case may be solved by Natural Sines,[*] according to the following Proportions:

As Unity or 1; Is to the length of the Hypothenuse; So is the Natural Sine of the smallest Angle; To the length of the shortest Leg. Or, So is the Natural Sine of the largest Angle; To the length of the longest Leg.

Or, which is the same thing, Multiply the Natural Sines of the two Angles by the Hypothenuse, the Products will be the length of the two Legs.

Example.

Nat. Sine of 35° 30′	Nat. Sine of 54° 30′
0.58070	0.81412
Hyp. 25	Hyp. 25
290350	407060
116140	162824
14.51750	20.35300
Leg BC 14.52	Leg AB 20.35

---

[*] See the Introduction to the Table of Natural Sines.

Note. The third Decimal figure in the first Product being 7, the preceding figure may be called one more than it is, *viz.* 2. And whenever in any Product, &c. there are more places of Decimals than you wish to work with, if the one at the Right Hand of the last which you wish to retain is more than 5, add a Unit to the last; because a greater number than 5 is more than half.

As the Table of Artificial or Logarithmic Sines, Tangents and Secants, contained in this Book, is calculated only for every 5 Minutes of a Degree, whenever any Question is to be solved where the Minutes cannot be found in that Table; or where the length of the Hypothenuse is such a number as cannot be found in the Table of Logarithms for Numbers, the Question may be solved by Natural Sines as above taught.

◆

CASE II.

The Angles and one Leg given, to find the Hypothenuse and the other Leg. Fig. 40.

In the Triangle ABC, given the Leg AB 325, the Angle at A 33° 15' and the Angle at C 56° 45'; to find the Hypothenuse and the Leg BC.

Making the given Leg Radius, the Proportions will be:

To find the Hypothenuse		*To find the Leg BC.*	
As Radius,	10.00000	As Radius,	10.00000
: Leg AB, 325	2.51188	: Leg AB, 325	2.51188
: : Sec. CAB, 33° 15'	10.07765	: : Tan. CAB, 33° 15'	9.81666
: Hyp. 388.6	12.58953	: Leg BC, 213.1	12.32854

Note. Reject the first figure, which is the same as subtracting Radius, and seek the numbers corresponding to the other figures.

Making the Leg BC Radius, the Proportions will be;

To find the Hypothenuse	*To find the Leg BC.*
As Tang. ACB, 56° 45'	As Tang. ACB, 56° 45'
: Leg AB, 325	: Leg AB, 325
: : Sect. ACB. 56° 45'	: : Radius
: Hyp. 388.6	: Leg BC, 213. 1

Making the Hypothenuse Radius, the Proportions will be:

To find the Hypothenuse.	*To find the Leg BC.*
As Sine BCA, 56° 45′	As Sine BCA, 56° 45′
: Leg AB, 325	: Leg AB, 325
: : Radius	: : Sine BAC, 33° 15′
: Hyp. 388.6	: Leg BC, 213.1

Note. If the Leg BC had been given, instead of the Leg AB, the Proportions would have been the same *mutatis mutandis.*

By Natural Sines.

To solve this Case by Natural Sines, institute the following Proportions:

To find the Hypothenuse. As the Natural Sine of the Angle opposite the given Leg; Is to the length of the Leg; So is Unity or 1; To the Length of the Hypothenuse.

Or, which is the same thing, Divide the given Leg by the Natural Sine of its opposite Angle, and the Quotient will be the Hypothenuse.

To find the other Leg. As the Natural Sine of the Angle opposite the given Leg; Is to the length of the given Leg; So is the Natural Sine of the Angle opposite the other Leg; To the length of the other Leg.

Example.

Given Leg 325. Nat. Sine of 56° 45′, the Angle opposite the given Leg 0.83629. Nat. Sine of 33° 15′, the Angle opposite the other Leg 0.54829.

As 0.83629 : 325 : : 1 : 388.6
As 0.83629 : 325 : : 0.54829 : 213.07

CASE III.

The Hypothenuse and one Leg given, to find the Angles and the other Leg. Fig. 41.

In the Triangle ABC, given the Hypothenuse AC 50 and the Leg AB 40; to find the Angles and Leg BC.

Making the Hypothenuse Radius, the Proportion to find the Angle ACB will be :

As Hyp. 50 -	1.69897
: Radius - -	10.00000
: : Leg AB, 40 -	1.60206
	11.60206
	1.69897
: Sine ACB, 53° 10'	9.90309

The Angle ACB being 53° 10' the other is consequently 36° 50'

Making the Leg AB Radius, the Angle BAC may be found by the following Proportion :

As Leg AB, 40 -	1.60206
: Radius -	10.00000
: : Hyp. 50 -	1.69897
	11.69897
	1.60206
: Sec. BAC, 36° 50'	10.09691

The Angles being found, the Leg BC may be found by either of the preceding Cases. It is 30.

By Natural Sines.

The Angle opposite the given Leg may be found by the following Proportion :

As the Hypothenuse ; Is to Unity or 1 ; So is the given leg ; To the Nat. Sine of its opposite Angle.

Or, which is the same thing, Divide the given Leg by the Hypothenuse, and the Quotient will be the Nat. Sine.

EXAMPLE.

The Leg AB 40 divided by the Hypothenuse 50 quotes 0.80000 which looked in the Table of Nat. Sines, the nearest corresponding number of Degrees and Minutes will be found to be 53° 8', the Angle ACB.

Note. The reason why the Angle as found by Nat. Sines differs 2 Minutes from the Angle as found by Logarithms, is that the Table of Logarithmic Sines, &c. contained in this Book, is calculated only for every 5 Minutes. By a Table of Logarithmic Sines, &c. calculated for every Minute, the Angle will be found the same.

◆

By the Square Root.

In this CASE the required Leg may be found by the Square Root, without Finding the Angles; according to the following PROPOSITION:

In every Right Angled Triangle, the Square of the Hypothenuse is equal to the Sum of the Squares of the two Legs. Hence,

The Square of the given Leg being subtracted from the Square of the Hypothenuse, the Remainder will be the Square of the required Leg.

As in the preceding EXAMPLE; The Square of the Leg AB 40 is 1600; this subtracted from the Square of the Hypothenuse 50 which is 2500, leaves 900, the Square of the Leg BC, the Square Root of which is 30, the length of Leg BC as found by Logarithms.

◆

CASE IV.

The Legs given to find the Angles and Hypothenuse. Fig. 42.

In the Triangle ABC, given the Leg AB 78.7 and the Leg BC 89; to find the Angles and Hypothenuse.

Making the Leg AB Radius, the Proportion to find the Angle BAC will be:

As Leg AB, 78.7	1.89597
: Radius	10.00000
: : Leg BC, 89	1.94939
	11.94939
	1.89597
: Tang. BAC, 48° 30'	10.05342

The Angle ACB is consequently 41° 30'.

Making the Leg BC Radius, the Proportion to find the Angle BCA will be the same as the above, *mutatis mutandis*.

The Angles being found, the Hypothenuse may be found by CASE II. It is nearest 119.

By the Square Root.

In this Case the Hypothenuse may be found by the Square Root, without finding the Angles; according to the following PROPOSITION.

In every Right Angled Triangle, the Sum of the Squares of the two Legs is equal to the Square of the Hypothenuse.

In the above EXAMPLE, the Square of AB 78.7 is 6193.69, the Square of BC 89 is 7921; these added make 14114.69 the Square Root of which is nearest 119.

By Natural Sines.

The Hypothenuse being found by the Square Root, the Angles may be found by Nat. Sines, according to the preceding CASE.

Hyp. Leg. BC. Nat. Sine
119) 89. 00000 (74789
833....
570
476
940
833
1070
952
1180
1071
109

The nearest degrees and Minutes corresponding to the above Nat. Sine are 48° 24', for the Angle BAC. The difference between this and the Angle as found by Logarithms is occasioned by dividing by 119, which is not the exact length of the Hypothenuse, it being a Fraction too much.

PART II.

Oblique Trigonometry.

The solution of the two first Cases of *Oblique Trigonometry* depends on the following Proposition.

In all Plane Triangles, the Sides are in proportion to each other as the Sines of their opposite Angles. That is, As the Sine of one Angle ; Is to its opposite Side ; So is the Sine of another Angle ; to its opposite Side. Or, As one Side ; Is to the Sine of its opposite Angle ; So is another Side ; To the Sine of its opposite Angle.

Note. When an Angle exceeds 90° make use of its Supplement, which is what it wants of 180°. As the Sine of 90° is the greatest possible Sine, the Sine of any number of Degrees will be as much less as that number of Degrees exceeds 90 ; and will be the same as the Sine of the Supplement of that number of Degrees : Thus the Sine of 100° is the same as the Sine of 80°, and the Sine of 130° the same as the Sine of 50°, &c.

CASE I.

The Angles and one side given, to find the other Sides. PLATE II. *Figure* 47.

In the Triangle ABC, given the Angle at B 48°, the Angle at C 72°, consequently the Angle at A 60°, and the Side AB 200; to find the Sides AC and BC.

To find the Side AC.		*To find the Side* BC.	
As Sine ACB, 72°	9.97821	As Sine ACB, 72°	9.97821
: Side AB, 200 -	2.30103	: Side AB, 200 -	2.30103
: : Sine ABC, 48°	9.87107	: : Sine BAC, 60°	9.93753
	12.17210		12.32856
	9.97821		9.97821
: Side AC, 156 -	2.19389	: Side BC, 182	2.26035

* * *

By Natural Sines.

As the Nat. Sine of the Angle opposite the given Side; Is to the given Side; So is the Nat. Sine of the Angle opposite either of the required Sides; To that required Side.

Given Side 200; Nat. Sine of 72°, its opposite Angle, 0.95115; Nat. Sine of ABC 48°, 0.74334; Nat. Sine of BAC 60°, 0.86617.

As 0.95115 : 200 : : 0.74334 : 156
As 0.95115 : 200 : : 0.86617 : 182

* * *

CASE II.

Two Sides and an Angle opposite to one of them given, to find the other Angles and Side. *Fig.* 48.

In the Triangle ABC, given the Side AB 240, the Side BC 200, and the Angle at A 46° 30'; to find the other Angles and the Side AC.

To find the Angle ACB.

As Side BC, 200	2.30103	Angle at A	46° 30'
: Sine BAC, 46° 30'	9.86056	C	60 30
: : Side AB, 240	2.38021		
			107.00
	12.24077		
	2.30103	Sum of the three Angles	180°
		Sum of two - - -	107
: Sine ACB, 60° 30'	9.93974		
		Angle at B - - -	73

The Side AC will be found by Case I. to be nearest 253.

Note. If the given Angle be Obtuse the Angle sought will be Acute; but if the given Angle be Acute, and opposite a given lesser Side, then the Angle found by the operation may be either Obtuse or Acute. It ought therefore to be mentioned which it is, by the conditions of the question.

* * *

By Natural Sines.

As the Side opposite the given Angle; Is to the Nat. Sine of that Angle; So is the other given Side; To the Nat. Sine of its opposite Angle.

One given Side 200; Nat. Sine of 46° 30', its opposite Angle, 0.72537; the other given Side 240.

As 200 : 072537 : : 240 : 0.87044=60° 30'.

* * *

CASE III.

Two Sides and their contained Angle given, to find the other Angles and Side. Fig. 49.

The solution of this Case depends on the following Proposition.

In every Plane Triangle, As the Sum of any two Sides; Is to their Difference; So is the Tangent of half the Sum of the two opposite Angles; To the Tangent of half the Difference between them. Add this half difference to half the Sum of the Angles and you will have the greater Angle; and subtract the half Difference from the half Sum and you will have the lesser Angle.

In the Triangle ABC, given the Side AB 240, the Side AC 180, and the Angle at A 36° 40′ to find the other Angles and Side.

Side AB -	240	AB -	240
AC -	180	AC -	180
Sum of the two Sides	420	Difference	60

The given Angle BAC 36° 40′, subtracted from 180°, leaves 143° 20′ the Sum of the other two Angles; the half of which is 71° 40′.

As the Sum of two Sides, 420	2.62325
: Their Difference, 60 - -	1.77815
: : Tangent half unknown Ang. 71° 40′	10.47969
	12.25784
	2.62325
: Tangent half Difference, 23° 20′	9.63459

The half sum of the two unknown Angles,	71° 40′
The half difference between them,	23 20
Add, gives the greater Angle ACB	95 00
Subtract, gives the lesser Angle ABC	48 20

The Side BC may be found by Case I or II.

CASE IV.

The three Sides given to find the Angles. Fig. 50.

The solution of this Case depends on the following Proposition.

In every Plane Triangle, As the longest side; Is to the Sum of the other two Sides; So is the Difference between those two Sides; To the Difference between the Segments of the longest Side, made by a Perpendicular let fall from the Angle opposite that Side.

Half the Difference between these Segments, added to half the Sum of the Segments, that is to half the length of the longest Side will give the greatest Segment; and this half Difference subtracted from the half Sum will be the lesser Segment. The Triangle being thus divided becomes two Right Angled Triangles, in which the Hypothenuse and one Leg are given to find the Angles.

In the Triangle ABC, given the Side AB 105, the Side AC 85, and the Side BC 50; to find the Angles.

Side AC -	85	AC - -	85
BC -	50	BC - -	50
Sum of the two Sides	135	Difference	35

As the longest Side AB, 105 -	2.02119
: Sum of the other two Sides, 135 -	2.13033
:: Difference between those Sides, 35	1.54407
	3.67440
	2.02119
: Difference between the Segments, 45	1.65321

Half the Side AB - - -	52.5
Half the Difference of the Segments -	22.5
Add, gives the greater Segment AD -	75.0
Subtract, gives the lesser Segment BD	30.0

Thus the Triangle is divided into two Right Angled Triangles, ADC and BDC; in each of which the Hypothenuse and one Leg are given to find the Angles.

To find the Angle DCA.		*To find the Angle* DCB.	
As Hyp. AC, 85 -	1.92942	As Hyp. BC, 50 -	1.69897
: Radius - -	10.00000	: Radius - -	10.00000
:: Seg. AD, 75 -	1.87506	:: Seg. BD, 30 -	1.47712
	11.87506		11.47712
	1.92942		1.69897
: Sine DCA, 61° 55′	9.94564	: Sine DCB, 36° 50′	9.77815

The Angle DCA 61° 55′ subtracted from 90° leaves the Angle CAD 28° 5′

The Angle DCB 36° 50′ subtracted from 90° leaves the Angle CBD 53° 10′.

The Angle DCA 61° 55′ added to the Angle DCB 36° 50′ gives the Angle ACB 98° 45′.

This Case may also be solved according to the following PROPOSITION.

In every plane Triangle, As the Product of any two Sides containing a required Angle; Is to the Product of half the Sum of the three Sides, and the Difference between that half Sum and the Side opposite the Angle required; So is the Square of Radius; To the Square of the Co-Sine of half the Angle required.

◆

Those who make themselves well acquainted with TRIGONOMETRY will find its application easy to many useful purposes, particularly to the mensuration of Heights and Distances; called ALTIMETRY and LONGIMETRY. These are here omitted because, as this work is designed principally to teach the Art of common FIELD SURVEYING, it was thought improper to swell its size and consequently increase its price, by inserting any thing not particularly connected with that Art.

It is recommended to those who design to be Surveyors to study TRIGONOMETRY thoroughly; for though a common field may be measured without an acquaintance with that Science, yet many cases will occur in practice where a knowledge of it will be found very beneficial; particularly in dividing Land, and ascertaining the boundaries of old Surveys. Indeed no one who is ignorant of TRIGONOMETRY, can be an accomplished Surveyor.

SURVEYING.

SURVEYING is the Art of measuring, laying out and dividing Land.

PART I.

MEASURING LAND.

The most common measure for Land is the Acre; which contains 160 Square Rods, Poles or Perches; or 4 Square Roods, each containing 40 Square Rods.

The instrument most in use, for measuring the Sides of Fields, is GUNTER'S Chain, which is in length 4 Rods or 66 Feet; and is divided into 100 equal parts, called Links, each containing 7 Inches and 92 Hundredths. Consequently, 1 Square Chain contains 16 Square Rods, and 10 Square Chains make 1 Acre.

In small Fields, or where the Land is uneven, as is the case with a great part of the Land in New-England, it is better to use a Chain of only two Rods in length; as the Survey can be more accurately taken.

SECTION I.

PRELIMINARY PROBLEMS.

PROBLEM I. *To reduce Two Rod Chains to Four Rod Chains.*

RULE. If the number of Two Rod Chains be even, take half the number for Four Rod Chains, and annex the Links if any: Thus, 16 Two Rod Chains and 37 Links make 8 Four Rod Chains and 37 Links.

But if the number of Chains be odd, take half the greatest even number for Chains, and for the remaining number add 50 to the Links: Thus, 17 Two Rod Chains and 42 Links make 8 Four Rod Chains and 92 Links.

PROBLEM II. *To reduce Two Rod Chains to Rods and Decimal Parts.*

RULE. Multiply the Chains by 2 and the Links by 4, which will give Hundredths of a Rod: Thus, 17 Two Rod Chains and 21 Links make 34 Rods and 84 Hundredths; expressed thus 34.84 Rods.

If the Links exceed 25 add 1 to the number of Rods and multiply the excess by 4: Thus, 15 Two Rod Chains and 38 Links make 31.52 Rods.

PROBLEM III. *To reduce Four Rod Chains to Rods and Decimal parts.*

RULE. Multiply the Chains, or Chains and Links, by 4; the Product will be Rods and Hundredths: Thus, 8 Chains and 64 Links make 34.56 Rods.

Note. The reverse of this Rule, that is, dividing by 4, will reduce Rods and Decimals to Chains and Links: Thus, 105.12 Rods make 26 Chains and 28 Links.

PROBLEM IV. *To reduce Square Rods to Acres.*

RULE. Divide the Rods by 160, and the Remainder by 40. if it exceeds that number, for Roods or Quarters of an Acre: Thus 746 Square Rods make 4 Acres, 2 Roods and 26 Rods.

PROBLEM V. *To reduce Square Chains to Acres.*

RULE. Divide by 10; or, which is the same thing, cut off the Right hand figure: Thus, 1460 Square Chains make 146 Acres; and 846 Square Chains make 84 Acres and 6 Tenths.

PROBLEM VI. *To reduce Square Links to Acres.*

RULE. Divide by 100000; or, which is the same thing, cut off the 5 Right hand figures: Thus, 38,45120 Square Links make 38 Acres and 45120 Decimals.

Note. When the Area of a Field, by which is meant its Superficial Contents, is expressed in Square Chains and Links, the whole may be considered as Square Links, and the number of Acres contained in the Field, found as above. Then multiply the figures cut off by 4, and again cut off 5 figures, and you have the Roods; multiply the figures last cut off by 40, and again cut off 5 figures, and you have the Rods.

EXAMPLE. How many Acres, Roods and Rods are there in 156 Square Chains and 3274 Square Links?

15)63274 Square Links
4

2)53096
40

21)23840

Answer. 15 Acres 2 Roods and 21 Rods.

PROBLEMS *for finding the Area of Right Lined Figures, and also of Circles.*

PROBLEM VII. *To find the Area of a Square or Parallelogram.*

RULE. Multiply the length into the breadth; the Product will be the Area.

PROBLEM VIII. *To find the Area of a Rhombus or Rhomboides.*

RULE. Drop a Perpendicular from one of the Angles to its opposite Side, and multiply that Side into the Perpendicular; the Product will be the Area.

PROBLEM IX. *To find the Area of a Triangle.*

RULE 1. Drop a Perpendicular from one of the Angles to its opposite Side, which may be called the Base; then multiply the Base by half the Perpendicular, or the Perpendicular by half the Base; the Product will be the Area. Or, multiply the whole Base by the whole Perpendicular, and half the Product will be the Area.

RULE 2. If it be a Right Angled Triangle, multiply one of the Legs into half the other; the Product will be the Area. Or, multiply the two Legs into each other, and half the Product will be the Area.

RULE 3. When the three Sides of a Triangle are known, the Area may be found Arithmetically, as follows:

Add together the three Sides; from half their Sum subtract each side, noting down the Remainders; multiply the half Sum by one of those Remainders, and that Product by another Remainder, and that Product by the other Remainder; the Square Root of the last Product will be the Area.

EXAMPLE. Suppose a Trianglewhose three Sides are 24, 20 and 18 Chains. Demanded the Area.

24+20+18=62, the Sum of the three Sides, the half of which is 31. From 31 subtract 24, 20 and 18; the three Remainders will be 7, 11 and 13.

31×7=217; 217×11=2387; 2387×13=31031, the Square Root of which is 176.1 or 17 Acres 2 Roods and 17 Rods.

By Logarithms.

As the Addition of Logarithms is the same as the Multiplication of their corresponding Numbers; and as the Number answering to the one half of a Logarithm will be the Square Root of the Number corresponding to that Logarithm; it follows, That if the Logarithm of the half Sum of the three Sides and the Logarithms of the three Remainders be added together, the Number corresponding to one half the Sum of those Logarithms will be the Area of the Triangle.

The half Sum, 31 - -	1.49136
The first Remainder, 7 - -	0.84510
The second Remainder, 11 -	1.04139
The third Remainder, 13 -	1.11394
The Square of the Area, 31000	4.49179
Area 176 Square Chains -	2.24589

Rule 4. When two Sides of a Triangle and their contained Angle, that is, the Angle made by those Sides, are given, the Area may be found as follows:

Add together the Logarithms of the two Sides and the Logarithmic Sine of the Angle; from their Sum subtract the Logarithm of Radius, the Remainder will be the Logarithm of double the Area.

Example. Suppose a Triangle one of whose Sides is 105 Rods and another 85, and the Angle contained between them 28° 5'. Demanded the Area.

One Side, 105 - - -	2.02119
The other Side, 85 - -	1.92942
Sine Angle, 28° 5' - - -	9.67280
	13.62341

(*Bro't over,*) - - -	13.62341
Subtract Radius - - -	10.00000
Double Area, 4200 Rods - -	3.62341

Answer. 2100 Rods.

Note. Radius may be subtracted by cancelling the Left hand figure of the Index, or subtracting 10, without the trouble of setting down the Cyphers.

By Natural Sines.

Multiply the two given Sides into each other, and that Product by the Natural Sine of the given Angle; the last Product will be double the Area of the Triangle.

Nat. Sine of the Angle 28° 5′ 0.47076

105×85=8925, and 8925×0.47076=4201 the double Area of the Triangle.

PROBLEM X. *To find the Area of a Trapezoid.*

RULE. Multiply half the Sum of the two parallel Sides by the perpendicular distance between them, or the sum of the two parallel Sides by half the perpendicular distance; the Product will be the Area.

PROBLEM XI. *To find the Area of a Trapezium, or irregular Four Sided Figure.*

RULE. Draw a Diagonal between two opposite Angles, which will divide the Trapezium into two Triangles. Find the Area of each Triangle and add them together. Or, multiply the Diagonal by half the Sum of the two Perpendiculars let fall upon it, or the Sum of the two Perpendiculars by half the Diagonal; the Product will be the Area.

Note. Where the length of the four Sides and of the Diagonal is known, the Area of the two Triangles, into which the Trapezium is divided, may be calculated Arithmetically, according to PROB. IX. *Rule* 3.

PROBLEM XII. *To find the Area of a Figure containing more than Four Sides.*

RULE. Divide the Figure into Triangles and Trapezia, by drawing as many Diagonals as are necessary; which Diagonals must be so drawn as not to intersect each other; then find the Area of each of the several Triangles or Trapezia, and add them together; the Sum will be the Area of the whole Figure.

Note. A little practice will suggest the most convenient way of drawing the Diagonals; but whichever way they are drawn, provided they do not intersect each other, the whole Area will be found the same.

PROBLEM XIII. *Respecting Circles.*

Rule 1. If the Diameter be given, the Circumference may be found by one of the following Proportions: As 7 is to 22; or more exactly, as 113 is to 355; or in Decimals, as 1 is to 3.14159; so is the Diameter to the Circumference.

Rule 2. If the Circumference be given, the Diameter may be found by one of the following Proportions: As 22 is to 7; or as 355 is to 113; or as 1 is to 0.31831; so is the Circumference to the Diameter.

Rule 3. The Diameter and Circumference being known, multiply half the one into half the other, and the Product will be the Area.

Rule 4. From the Diameter only to find the Area: Multiply the Square of the Diameter by 0.7854, and the Product will be the Area.

Rule 5. From the Circumference only to find the Area; Multiply the Square of the Circumference by 0.07958, and the Product will be the Area.

Rule 6. The Area being given to find the Diameter: Divide the Area by 0.7854, and the Quotient will be the Square of the Diameter; from this extract the Square Root, and you will have the Diameter.

Rule. 7. The Area being given to find the Circumference; Divide the Area by 0.07958, and the Quotient will be the Square of the Circumference; from this extract the Square Root and you will have the Circumference.

SECTION II.

The following Cases teach the most usual methods of taking the Survey of Fields; also how to protract or draw a Plot of them, and to calculate their Area.

Note. The Field Book is a Register containing the length of the Sides of a Field, as found by measuring them with a Chain; also the Bearings or Courses of the Sides, or the Quantity of the several Angles, as found by a Compass, or other instrument for that purpose; together with such Remarks as the Surveyor thinks proper to make in the Field.

CASE I.

To survey a Triangular Field.

Measure the Sides of the Field with a Chain, and enter their several lengths in a FIELD BOOK; protract the Field on Paper, and then find the Area by PROB. IX. *Rule* 1. Or, without plotting the Field, calculate the Area by PROB. IX. *Rule* 3.

FIELD BOOK. *See* PLATE II. *Fig.* 46.

	Chains.
AB - -	20
BC - -	24
CA - -	18

To find the Area.

	Ch. L.
Base BC - -	24.00
Half Perp. AD -	7.34

9600
7200
16800

Acres 17)61600
4

Roods 2) 46400
40

Roods 18)56000

Acres Roods Rods
Area 17 — 2 — 18.56

Note. When there are cyphers at the Right Hand of the Links, they may be rejected; remembering to cut off a proper number of figures according to Decimal Rules.

◆

Observe, That in measuring with a Chain, slant or inclined Surfaces, as the Sides of Hills, should be measured horizontally, and not on the Plane or Surface of the Hill; otherwise a survey cannot be accurately taken. To effect this, the lower end of the Chain must be raised from the ground, so as to have the whole in a horizontal Line; and the end thus raised must be directly over the Point where the Chain begins or ends, according as you are ascending or descending a Hill; which Point may be ascertained by a Plummet and Line.

◆

CASE II.

To survey a Field in the form of a Trapezium.

Measure the several sides, and a Diagonal between two opposite Angles; protract the Field, and find the Area by Problem XI. Or, without protracting the Field, calculate the Area according to the *Note* at the end of that Problem.

FIELD BOOK. *See* Plate II. *Fig.* 51.

			Ch. L.
AB	-	-	27.50
BC	-	-	11.70
CD	-	-	21.50
DA	-	-	14.70
Diagonal AC	-	-	28.

To protract this Trapezium.

Draw the Side AB the given length; with the Diagonal AC 28 and the Side BC 11.70 describe cross Arches as at C, from A and B as Centres; and the Point of intersection will represent that Corner of the Field: Then with the Side CD 21.50 and the Side AD 14.70 describe cross Arches as at D, from A and C as Centres; and the Point of intersection will represent that Corner of the Field.

◆

To find the Area.

Perpendicular B a	-	-	11.34
— D m	-	-	11.10
			22.44
Half Diagonal AC	-	-	14.00
			897600
			2244

(*Bro't over*) Acres 31)416
4

Rood 1)664
40

Rods 26)560

Acres Rood Rods
Area 31 — 1 — 26.56

Note. The Perpendiculars need not be actually drawn; their length may be obtained as follows: From the Angle opposite the Diagonal open the Dividers so as when one Foot is in the angular Point, as at B, the other, being moved backwards and forwards, may just touch the Diagonal at a, and neither go the least above or below it; that distance in the Dividers being measured on the Scale will give the length of the Perpendicular.

CASE III.

To survey a Field which has more than four Sides, by the Chain only.

Measure the several Sides, and from some one of the Angles, from which the others may be seen, measure Diagonals to them; draw a Plot of the Field, and find the Area by Problem XII.

FIELD BOOK. *See* Plate II. *Fig* 52.

	Ch. L.	*Diagonals.*	Ch. L.
AB - -	30.60		
BC - -	20.40		
CD - -	22.40	AC - -	45.
DE - -	16.20	AC - -	35.
EF - -	13.50	AE - -	24.20
FA - -	28.		

To protract this Field.

Draw the Side AB, making it the given length 30.60; with the Diagonal AC 45 and the Side BC 20.40 describe cross Arches as at C, from the Points A and B as Centres; and the Point of intersection will represent that Corner of the Field; Draw the Side BC and the dotted Diagonal AC: With the Diagonal AD 35 and the Side CD 22.40 describe cross Arches as at D, from the Points A and C; and draw the Side CD and the dotted Diagonal AD. Proceed in this manner till all the Sides and Diagonals are drawn.

* * *

To find the Area.

The Field being plotted may be divided into one Trapezium and two Triangles; The Area of which is calculated as follows.

The *Trapezium* ABCD.

Perpend. B a	11.68
— D o	17.10
	28.78
Half Diag. AC	22.50
	143900
	5756
	5756
Square Chains	647.5500

The *Triangle* AFE

Perpend. E n	11.65
Half Side AF	14
	4660
	1165
Square Chains	163.10

	Acres	Rood	Rods
Area	98	0	34.4

The *Triangle* ADE.

Half Perp. E m	4.90
Diag. AD	35
	2450
	1470
Square Chains	171.50

Trap. ABCD	647.55
Triangle ADE	171.50
Triangle AFE	163.10
Acres	98(215
	4
Roods	.860
	40
Rods	34)400

* * *

REMARKS.

As each of the Sides of the several Triangles into which the preceding Plot of a Field is divided, is known from the field Book, the Area of the Field may be calculated Arithmetically, by finding the Area of each Triangle, according to Prob IX. *Rule* 3; and then adding the whole together. This method, though it may require more time, is preferable to the other, because more accurate. Indeed it is always better to calculate the Area of a Field Arithmetically than Geometrically; for in the former no two persons can differ in their calculations;

whereas according to the latter, which is the common method of casting the Contents of a Field, it is hardly to be expected that any two persons will perfectly agree. The inaccuracy of Scales, and the difficulty of determining with precision the length of Sides and Perpendiculars, with a Scale and Dividers, render it almost if not quite impossible to obtain the exact Area of a Field, in the method commonly practised; even if the Surveyor has measured it accurately in the first place.

Other methods of taking the Survey of a Field, by the Chain only are mentioned in some Treatises on this subject, but they are rather curious than useful; and it is much better to ascertain the Angles by an accurate Compass, or some Instrument designed purposely for taking Angles.

CASE IV.

To Survey a Field with a Chain and Compass.

Measure the length of the Sides with a Chain, and take their bearing or Course with a Compass;[*] enter these in a Field Book; plot the Field on Paper, and calculate the Area by the directions already given.

To protract or draw a Map of a Field.

Draw a Line to represent a Meridian, or North and South Line, from which lay off a Bearing or Course of the first Side of the Field, with a Protractor or from a Line of Chords; and from a Scale of equal Parts measure the length of the Side and draw a Line to represent it.

At the end of this Line draw a Line parallel to the Meridian Line and then lay off the second Side of the Field as before taught: Proceed in the same manner to draw parallel Lines and lay off the several Sides till the whole is protracted.

In protracting a Field, let the Top of the Paper be considered as North; the Bottom, South; the Right hand, East; and the Left hand, West: lay the Course to the Right or Left of the Meridian Line, according as it is East or West; and from the upper or lower part of the Line, according as it is North or South.

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[*] A Compass may be so constructed with two Indexes, one moveable and the other fixed, as to ascertain the Angle made by two Sides, without reference to the Bearing of those Sides. Such a Compass would be particularly useful in surveying Land where there are mineral substances which have an influence upon the Compass Needle, attracting it one way or the other; and thus rendering it impossible to take a Course by it with precision.

In all protractions, if the end of the last distance falls exactly on the Point from which you began, the Course also being right, the Field work and protraction are truly taken and performed; if not, an error must have been committed in one of them: In such cases make a second protraction; if this agrees with the former, it is to be presumed the fault is in the Field work; a re-survey must then be taken.

EXAMPLE I.

FIELD BOOK. *See* PLATE II. *Fig.* 53.

					Ch. L.
AB.	N.	7°	0′	W.	28.20
BC.	N.	74	0	E.	39.50
CD.	S.	9	0	E.	38.
DE.	N.	63	20	W.	14.55
EA.	S.	74	0	W.	28.60

	Acres	Rood	Rods
Area	117 —	1 —	6

REMARKS.

The Sides of the several Triangles into which the Plot of a Field is divided may be found by Trigonometry; and then the Area of each Triangle may be calculated according to PROB. IX. *Rule* 3. The Sum of the Areas of the several Triangles will be the Area of the whole Field. This method may require more time but it is perfectly accurate, since no dependence is placed on the uncertain measurement of Scale and Dividers.

In the preceding EXAMPLE, suppose the Field divided into three Triangles. *See Fig.* 53. In the *Triangle* EAB, the Sides EA and AB are known from the FIELD BOOK, and their contained Angle is known from the Bearing of the Sides. The other Angles and the Side EB may be found by OBLIQUE TRIGONOMETRY, CASE III; and then there will be the three Sides to find the Area. In the

Triangle EBC, the Side BC is known from the Field Book, and the Side EB is found as above mentioned; the Angle EBA is also found as above; this subtracted from the Angle ABC, which may be found from the Bearing of the Sides AB and BC, will leave the Angle EBC: there will then be the two Sides and their contained Angle to find the the third Side; and this being found there will be the three Sides to find the Area. In the *Triangle* EDC, the Sides DE and DC are known from the Field Book, and their contained Angle is known from the Bearing of the Sides. The Side EC and the Area may be found as above.

It is recommended to the Learner to make these calculations, as it will improve him in the knowledge of Trigonometry.

Note. Two Sides and their contained Angle being given, the Area may be found by Prob. IX. *Rule* 4.

◆

Another Method of protracting Fields.

Without drawing parallel Lines at the end of each Side, a Field may be protracted by the Angles made by the several Sides; and the Angle made between any two Sides may be found by the following Rules.

Rule 1. If the course or Bearing of one of the Sides is Northerly and the other Southerly, one Easterly and the other Westerly, subtract the less Course from the greater, the Remainder will be the Angle between them.

Rule 2. If one is Northerly and the other Southerly, and both Easterly or Westerly, add both Courses together; the Sum will be the Angle between them.

Rule 3. If both are Northerly or Southerly, and one Easterly and the other Westerly, subtract the Sum of both from 180°; the Remainder will be the Angle between them.

Rule 4. If both are Northerly or Southerly, and both Easterly or Westerly, add 90°, the less Course and the Complement of the greater together; the Sum will be the Angle between them.

To protract a Field according to the preceding Rules is preferable to the method of doing it by parallel Lines, though it may not be so easy to the Learner at first. It is difficult to draw parallel Lines with perfect accuracy, particularly without a parallel Rule; and a small deviation from a true Line may make considerable difference in the Plot of a Field.

Example II.

FIELD BOOK. *See* Plate III. *Fig.* 58.

					Ch. L.
AB.	N.	16°	30'	E.	22.
BC.	N.	82	0	E.	19.60
CD.	S.	17	0	E.	24.
DE.	S.	37	0	W.	22.
EA.	N.	49	0	W.	25.20

Area 85 Acres.

To draw a Plot of this Field, according to the preceding Rules.

Having drawn the Side AB, according to the directions before given for laying off the first Course and Distance, compare the first and second Courses together, and they will be found to be both Northerly and both Easterly; consequently the Angle between them is found by Rule 4. as follows: 90° added to 16° 30' the less Course and 8° the Complement of the greater, the Sum is 114° 30' for the Angle at B. Compare the second and third Courses, and they will be found to be one Northerly and one Southerly and both Easterly; consequently, according to Rule 2. 82° the second Course added to 17° the third Course, the Sum 99° is the Angle at C. The third and fourth Courses are both Southerly and one Easterly and the other Westerly. The Angle between them at D is 126°; for 17° the third Course added to 37° the fourth Course is 54° which subtracted from 180° leaves 126°, according to Rule 3. The fourth and fifth Courses are one Southerly and the other Northerly and both Westerly. According to Rule 2. 37° the fourth Course added to 49° the fifth Course, the Sum 86° is the Angle at E.

A little practice will render this mode of protracting a Field familiar and easy, and an attention to the Courses will show in what direction the Angle is to be made.

EXAMPLE III.

FIELD BOOK. *See* PLATE IV. *Fig.* 66.

					Ch. L.
AB.	N.	56°	15'	E.	21.60
BC.	N.	26	30	E.	13.44
CD.	S.	71	30	E.	18.96
DE.	S.	26	30	E.	13.44
EF.	S.	71	30	W.	18.96
FG.	S.	45	0	E.	8.47
GH.	S.	63	30	E.	13.44
HI.	N.	45	0	E.	8.47
IK.	S.	26	30	E.	13.44
KL.	S.	45	0	W.	8.47
LM.	S.	63	30	W.	13.44
MN.	N.	76	0	W.	24.73
NA.	N.	36	45	W.	30.

Acres Rood Rods.
Area 167 — 1 — 30

The above Field may be protracted, and its Area calculated according to the directions given in the preceding EXAMPLES.

◆

Several Field Books to exercise the Learner in plotting Fields and calculating their Area.

No. I.					Rods.
1.	N. 15°	0'	E.		320
2.	N. 37	30	E.		160
3.	East				120
4.	S. 11	0	E.		200
5.	South				216
6.	West				160
7.	S. 36	30	W.		160
8.	N. 38	15	W.		136

Acres Roods Rods
Area 744 — 3 — 28

No. II.					Ch. L.
1.	N.	75°	0'	E.	13.70
2.	N.	20	30	E.	10.30
3.	East				16.20
4.	S.	33	30	W.	35.30
5.	S.	76	0	W.	16.
6.	North				9.
7.	S.	84	0	W.	11.60
8.	N.	53	15	W.	11.60
9.	N.	36	45	E.	19.20
10.	N.	22	30	E.	14.
11.	S.	76	45	E.	12.
12.	S.	15	0	W.	10.85
13.	S.	16	45	W.	10.12

Acres Roods Rods.
Area 110 — 2 — 23

No. III.					Rods.
1.	S.	65°	40'	W.	49.7
2.	S.	67	15	W.	34.5
3.	S.	54	0	W.	17.9
4.	S.	20	0	W.	5.8
5.	S.	7	60	E.	29.4
6.	N.	83	0	E.	107.4
7.	N.	5	50	W.	22.
8.	N.	18	30	W.	46.

Acres Rood Rods.
Area 34 — 1 — 19

No. IV.					Rods.
1.	N.	43°	0'	W.	12.44
2.	N.	64	0	W.	8.
3.	N.	52	0	W.	14.60
4.	N.	37	5	W.	51.36
5.	N.	15	30	W.	21.76
6.	N.	20	40	W.	44.60
7.	N.	88	20	E.	167.60
8.	S.	34	40	E.	71.20
9.	S.	75	0	W.	69.72
10.	S.	55	0	W.	64.60
11.	S.	25	0	W.	18.12

Acres Roods Rods
Area 97 — 2 — 29

		No.	V.		Rods.
1.	S.	11°	50′	W.	34.6
2.	S.	63	20	E.	93.6
3.	N.	4	0	W.	34.9
4.	S.	89	55	E.	40.1
5.	N.	5	20	W.	35.5
6.	N.	69	40	W.	60.
7.	S.	78	0	W.	30.6
8.	N.	67	20	W.	1.2
9.	S.	72	30	W.	10.4
10.	S.	66	55	W.	15.2

Acres Rood Rods.

Area 41 — 1 — 34

		No.	VI.		Rods.
1.	S.	34°	0′	E.	42.8
2.	S.	29	0	E.	69.4
3.	S.	64	50	W.	53.
4.	S.	25	0	E.	4.
5.	S.	66	30	W.	39.
6.	N.	25	0	W.	4.
7.	S.	64	45	W.	32.2
8.	N.	30	30	W.	18.3
9.	N.	56	30	E.	34.5
10.	N.	64	0	E.	12.5
11.	N.	49	0	E.	14.
12.	N.	26	10	W.	19.3
13.	N.	21	0	W.	18.3
14.	N.	44	10	W.	18.
15.	N.	64	40	E.	30.5
16.	N.	18	30	W.	39.
17.	N.	86	5	E.	26.7

Acres Rood Rods

Area 48 — 1 — 12

		No.	VII.		Ch. L.
1.	N.	0°	45′	W.	9.
2.	N.	19	30	W.	5.35
3.	N.	23	0	W.	4.09
4.	N.	41	35	W.	6.15
5.	N.	3	0	W.	36.75
6.	S.	86	50	W.	13.33
7.	N.	2	15	W.	17.65
8.	N.	85	45	E.	12.56
9.	S.	2	10	E.	8.
10.	N.	86	45	E.	7.38
11.	S.	3	15	E.	13.20
12.	N.	87	0	E.	29.92
13.	N.	49	20	E.	4.04
14.	North				2.23
15.	N.	50	35	E.	6.50
16.	S.	22	50	E.	17.94
17.	S.	34	0	W.	3.50
18.	S.	41	0	W.	3.
19.	S.	22	50	W.	9.25
20.	S.	3	40	E.	2.64
21.	S.	86	0	W.	2.50
22.	S.	0	25	W.	14.50
23.	S.	2	0	W.	5.38
24.	S.	10	0	E.	11.75
25.	S.	86	0	W.	34.60

Acres Roods Rods

Area 268 — 3 — 7

		No.	VIII.		Rods
1.	S.	6°	30′	E.	19.1
2.	S.	63	30	E.	14.36
3.	S.	67	0	E.	10.68
4.	N.	88	0	E.	13.3
5.	S.	31	30	W.	32.44
6.	S.	31	55	W.	96.5
7.	S.	33	25	W.	34.9
8.	S.	20	45	E.	3.68
9.	S.	16	15	W.	64.
10.	N.	52	30	W.	12.8
11.	S.	45	0	W.	18.24
12.	S.	69	0	W.	21.4
13.	S.	12	40	W.	9.4
14.	S.	84	20	W.	9.5
15.	N.	22	15	W.	24.
16.	North				9.8
17.	N.	29	15	W.	30.6
18.	N.	44	25	W.	21.8
19.	N.	61	30	W.	23.1
20.	N.	41	0	W.	10.8
21.	N.	36	0	E.	41.56
22.	S.	68	0	E.	80.6
23.	N.	44	30	E.	20.4
24.	N.	2	30	W.	41.
25.	N.	14	45	W.	62.32
26.	N.	16	0	W.	14.8
27.	N.	1	45	W.	14.8
28.	N.	82	30	E.	99.

Acres Rood Rods

Area 135 — 1 — 15

CASE V.

To survey a Field from one Station, at any place within the Field, from which the several Angles may be seen.

Take the Bearing of the Angles, and measure their Distance from the Station.

FIELD BOOK. *See* PLATE III. *Fig.* 61.

					Ch. L.
From Station to	A.	N.	20°	W.	8.70
	B.	N.	60	E.	10.
	C.	N.	87	E.	11.40
	D.	S.	15	E.	10.50
	E.	S.	60	W.	12.
	F.	N.	65	W.	8.78

To protract this Field.

Draw a Meridian Line as N. S. From some point in that Line as a Centre lay off the Bearing and Distance to the several Angles, and draw Lines from one Angle to another, as AB, BC, CD, &c.

To find the Area.

The Area may be calculated according to PROB. XII. by measuring Diagonals and Perpendiculars; or more accurately according to PROB. IX. *Rule* 4.

As the Bearing and Distance of the Lines from the Station to the several Angles are known, two Sides and their contained Angle are given in each of the Triangles into which the Plot is divided; the Area may, therefore, be readily calculated by the *Rule* above referred to.

Note. As in the operation, the Logarithm of Radius is to be subtracted from the Sum of the other Logarithms, it may be done by rejecting the Left hand figure, without the trouble of putting down the Cyphers and subtracting.

Triangle aAB.

a A, 8. 70	0.93952
aB, 10	1.00000
Sine AaB, 80°	9.99335
Doub. Area, 85.7	1.93287

Triangle aBC.

aB, 10	1.00000
aC, 11.40	1.05690
Sine BaC, 27°	9.65705
Doub. Area, 51.8	1.71395

Triangle aCD.

aC, 11.40	1.05690
aD, 10.50	1.02119
Sine CaD, 78°	9.99040
Doub. Area, 117	2.06849

Triangle aDE.

aD, 10.50	1.02119
aE, 12	1.07918
Sine DaE, 75°	9.98494
Doub. Area, 122	2.08531

Triangle aEF.		*Triangle* aFA.	
aE, 12 - -	1.07918	aF, 8.78 - -	0.94349
aF, 8.78 - -	0.94349	aA, 8.70 - -	0.93952
Sine EaF, 55° -	9.91336	Sine FaA, 45° -	9.84948
Doub. Area, 86.3	1.93603	Doub. Area, 54 -	1.73249

Triangle aAB	-	85.7
aBC	-	51.8
aCD	-	117.
aDE	-	122.
aEF	-	86.3
aFA	-	54.
Double Area	-	516.8
Area	-	25)84

4

3)36

40

14)40

	Acres	Roods	Rods
Area	25 —	3 —	14.4

◆

CASE VI.

To survey a Field from some one of the Angles, from which the others may be seen.

From the stationary Angle take the Bearing and Distance to each of the other Angles, with a Compass and Chain.

FIELD BOOK. *See* PLATE III. *Fig.* 59.

				Ch. L.
FG.	N.	70°	W.	14.60
FA.	N.	50	W.	18.20
FB.	N.	30	W.	16.80
FC.	N.	10	W.	21.20
FD.	N.	7	E.	16.95
FE.	N.	30	E.	8.50

To draw a Plot of this Field.

Draw a Meridian Line to pass through the stationary Angle as at F. From the Point F lay of the Bearing and Distance to the several Angles, and connect them by Lines, as FG, FA, FB, &c.

The Area may be calculated as taught in the preceding CASE.

CASE VII.

To survey a Field from two Stations within the Field, provided the several Angles can be seen from each Station.

Find the Bearing from each Station to the respective Angles; and also the Bearing and Distance from one Station to the other.

FIELD BOOK. *See* PLATE III. *Fig.* 62.

First Station.					*Second Station.*				
AC.	N.	38°	30′	E.	BC.	S.	82°	0′	E.
AD.	S.	69	0	E.	BD.	S.	17	0	E.
AE.	S.	59	0	W.	BE.	S.	28	0	W.
AF.	N.	63	0	W.	BF.	S.	49	0	W.
AG.	N.	21	0	W.	BG.	N.	76	0	W.
AH.	North.				BH.	N.	24	0	W.

Stationary Line AB. N. 14° E. 20 Chains.

To protract this Field.

At the first Station A draw a Meridian Line and lay off the Bearings to the respective Angles; draw the stationary Line AB, according to the Bearing and Distance; at B draw a Meridian Line parallel to the other, and lay off the Bearings to the Angles, as taken from this Station; from each Station draw Lines through the Degree which shows the Bearing of each Angle, as marked by the Protractor or Line of Chords, and the Points where those Lines intersect each other will be the Angles of the Field. Connect those angular Points together by Lines, and those Lines will represent the several Sides of the Field.

CASE VIII.

To survey an inaccessible Field.

Fix upon two Stations, at a convenient distance from the Field, from each of which the several Angles may be seen; from each Station take the Bearing of the Angles; and take the Bearing and Distance from one Station to the other.

FIELD BOOK. *See* PLATE IV. *Fig.* 67.

First Station.					*Second Station.*				
AE.	N.	9°	15′	E.	BE.	N.	50°	0′	W.
AF.	N.	16	0	E.	BF.	N.	29	15	W.
AG.	N.	14	30	E.	BD.	N.	24	0	W.
AD.	N.	39	0	E.	BG.	N.	21	30	W.
AH.	N.	40	0	E.	BH.	N.	5	0	E.
AC.	N.	72	0	E.	BC.	N.	20	30	E.

Ch. L.

Stationary Distance AB, S. 88° 30′ E. 19.20.

The directions given in the last CASE for plotting the Field, will apply in this CASE also; and the Area in this and the preceding CASE may be calculated in the manner pointed out in CASE IV. by dividing the Plot into Triangles and measuring Diagonals and Perpendiculars. Or the Sides may be found by Trigonometry, and the Area calculated Arithmetically, as already taught.

CASE IX.

To survey a Field where the boundary Lines are very irregular, without noticing with the Compass every small Bend.

Begin near one corner of the Field, as at A, PLATE IV. *Fig.* 68. and measure to the next large Corner, as B, in a straight Line; noticing also the Bearing of this Line. From the Line take Offsets to the several Bends, at Right Angles from the Line; noticing in the FIELD BOOK at what part of the Line they are taken, as at A 1, H 2, I 3, B 4. Proceed in the same manner round the Field. In the *Figure* the dotted Lines represent the stationary Lines, and the black Lines the Boundaries of the Field.

FIELD BOOK.

Bearing and Distance,	Offsets	Bearing and Distance.	Offsets
Ch. L.	Ch. L.	Ch. L.	Ch. L.
AB. N. 85° 0′ E. 11.20	0.56	EF. S. 67° 50′ W. 8.20	0.40
at 5.40	1.40	at 1.4	0.36
8.26	0.36	2.96	0.33
the end	0.36	5.88	1.
		the end	0.12
BC. N. 7° 20′ E. 7.96	0.20		
at 2.36	0.36	FG. S. 27° 40′ E 7.06	1.20
4.28	0.96	at 2.	0.24
the end	0.30	the end	0.16
CD. N. 62°.0′ W. 4.68		GA. S. 25° 20′ W. 6.48	
at 4.34	0.30	at 3.80	0.80
		the end	0.40
DE. N. 11° 10′ W. 4.20	0.30		

To protract this Field.

Draw the stationary Lines according to the directions in CASE IV. From A make an Offset of 56 Links to I; measure from A to H 540 Links and make the Offset H 2, 140 Links; measure from A to I 826 Links and make the Offset I 3, 36 Links: at B make the Offset B 4, 36 Links. Proceed in the same manner round the Field, and connect the ends of the Offsets by Lines, which will represent the Boundaries of the Field.

◆

To find the Area.

Find the Area within the Stationary Lines as before taught; then of the several small Trapezoids, Parallelograms and Triangles made by the stationary Lines, Offsets and boundary Lines, and add the whole together: Thus, add 56 Links the Offset A 1 to 140 Links the Offset H 2 and multiply their sum 196 by half 540 the length of the line AH, and the Product 52920 Square Links will be the Area of the Trapezoid AH21: Again, add 140 the Offset H2 to 36 the Offset I3 and multiply their Sum 176 by half 286 the length of the Line HI, and the product 25168 Square Links will be the Area of the Trapezoid HI 32. Proceed in the same manner to calculate the Area of all the Trapezoids, Triangles, &c.

CASE X.

To survey a Field by taking Offsets both to the Right and Left; that is, within and without the Field, as occasion shall require, in consequence of the Stationary Lines crossing the boundary Lines: Also, by Intersections, that is, taking the Bearing of an inaccessible Corner from two Stations.

The directions given in the preceding CASE, together with the following FIELD BOOK, will show the Learner how to survey a Field like the following, and also to protract it when surveyed.

FIELD BOOK. *See* PLATE IV. *Fig.* 69.

Offsets to the Left	Bearing and Distance.	Offsets to the Right.	Remarks.
Ch. L. 1.12 3.40 1.25	Ch. L. AB. N. 88° 0′ W. 22.12 at 4.25 7.40 13.	Ch. L.	A Tower bears from A. N. 48°. W.
0.45	BC. N. 27° 45′ W. 21.12 at 4.10 10.25 15.	1.20 1.15	From B the Tower bears N. 38° 30′ E.
	C 1. S 82° 15′ E. 5.45 1, 2. N. 70 0 E. 13.25 2 D. N. 20 0. E. 3.36		From C go into the Field to 1, on account of some impediment on or near the boundary Line. At D, you get into another Corner of the Field.
	DF. S. 35° 0′ E. 15.15		E an inaccessible Corner bears from D. S. 65° 30′ E.
2.20 2.32	FA. S. 15° 15′ E. 15.10 at 1.20 7.45 12.25	0.36	E the inaccessible Corner bears from F N. 4° W.

Note. To draw a Tree, House, Tower, or any other remarkable object, in its proper place, in the Plot of a Field—From any two Stations, while surveying the Field, take the Bearing of the object; and the intersection of the Lines, which represent the Bearings, will determine the place of the object; in the same manner that the Tower is drawn in the Figure.

To find the Area of the above Field.

Find the Area within the stationary Lines, and then of the several small Trapezoids, &c. remembering to distinguish those without the stationary Lines from those which are within. Subtract the Area of those within the stationary Lines from the Area of those without, and add the Remainder to the Area contained within the stationary Lines; the sum will be the whole Area of the Field.

SECTION III.

RECTANGULAR SURVEYING, *or an accurate method of calculating the Area of a Field Arithmetically, from the* FIELD BOOK, *without the necessity of protracting it, and measuring with a Scale and Dividers, as is commonly practised.*

I. Survey the Field, in the usual method with an accurate Compass and Chain; and from the FIELD BOOK set down, in a Traverse Table, the Course or Bearing of the several Sides, and their length in Chains and Links, or Rods and Decimal parts of a Rod; as in the 2d and 3d Columns of the following EXAMPLE.

EXAMPLE I.

No.	Courses	dis ch	N.	S.	E.	W.	1 Dep. Col.	2 Dep. Col.	North Areas	South Areas
1	N. 15° 0′ E.	80	77.27 77.15	....	20.71 20.74	..	20.74	20.74	1600.0910	....
2	N. 37 30 E.	40	31.73 31.66	....	24.35 24.38	..	45.12	65.86	2085,1276	....
3	East	30	...	....	30. 0 30.04	..	75.16	120.28	....	....
4	S. 11 0 E.	50	...	49.08 49.15	9.54 9.56	..	84.72	159.88	....	7858.1020
5	South	54	...	54. 0 54.10	....	..	84.72	169.44	....	9166.7040
6	West	40	...	....	....	40. 0 39.95	44.77	129.49	....	....
7	S. 36 30 W.	40	...	32.15 32.21	....	23.79 23.75	21.02	65.79	....	2119.0959
8	N. 38 15 W.	34	26.70 26.65	....	....	21.05 21.02	0. 0	21.02	560.1830	....
			135.70 135.46	135.23 135.46	84.60 84.72	84.84 84.72			4245.4016	19143.9019

19143.9019 Sum of South Areas
4245.4016 North Do.

2)14898.5003 Double Area of the Field

Acres 744)92501
4

Roods 3)70004
40

Acres Roods Rods
Rods 28)00160 *Area* 744— 3 — 28

2. Calculate by RIGHT ANGLED TRIGONOMETRY, CASE I. or find by the Table of Difference of Latitude and

Departure,* or by the Table of Natural Sines,† the Northing or Southing, Easting or Westing made on each Course, and set them down against their several Courses, in their proper Columns, marked N. S. E. W.

Note. To determine whether the Latitude and departure for any particular Course and Distance are accurately calculated, square each of them; and if they are right, the Sum of their Squares will equal the Square of the distance, for the following reason: The Latitude and Departure represent the two Legs of a Right Angled Triangle, and the Distance the Hypothenuse; and it is a Mathematical truth, that the Square of the Hypothenuse of any Right Angled Triangle is equal to the Sum of the Squares of the two Legs.

3. If the Survey has been accurately taken, the Sum of the Northings will equal the Southings; and the Eastings will equal the Westings. If upon adding up the respective Columns, these are found to differ very considerably, the Field should be again surveyed; as some error must have been committed either in taking the Courses or measuring the Sides. If the difference is small, a judicious, experienced Svrveyor will judge from the nature of the ground or shape of the Field surveyed, where the mistake was most probably made, and will correct accordingly. Or, the Northings and Southings, and the Eastings and Westings may be equalled by balancing them as follows; Subtract one half the difference from that Column which is the largest, and add the other half to that Column which is the smallest; and let the difference to be added or subtracted be divided among the several Courses according to their length.

In EXAMPLE I. the upper numbers are the northings, &c. as found by a Table of Difference of Latitude and Departure. The several Columns being added, the Northings are found to exceed the Southings 47 Links; and the Westings to exceed the Eastings 24 Links. They may be balanced by taking 24 Links from the Northings, and adding 23 Links to the Southings; and taking 12 Links from the Westings and adding 12 Links to the Eastings. Take from the first Course of the Northings 12 Links, from the second 7, and from the third 5; to the first Southing add 7 Links, to the second 10, and to the third 6: add to the first Easting 3 Links, to the second 3, to the third

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* For an explanation of this Table, and the manner of using it, see the remarks preceding the Table.

† See the Remarks preceding the Table of Natural Sines.

4, and to the fourth 2; take from the first Westing 5 Links, from the second 4, and from the third 3. The lower numbers will then represent the Northings, &c. as balanced.

4. These Columns being balanced, proceed to form a Departure Column, or a Column of Meridian Distances; which shows how far the end of each Side of the Field is East or West of the Station where the calculation begins. This Column is formed by a continual addition of the Eastings and subtraction of the Westings; or by adding the Westings and subtracting the Eastings: *See* EXAMPLE I.

The first Easting 20.74 is set for the first number in the Departure Column; to this add 24.38 the second Easting, and it makes 45.12 for the second number; to this add 30.04 the third Easting and it makes 75.16 for the third number; to this add 9.56 the fourth Easting, and it makes 84.72 for the fourth number; the fifth Course being South, it is evident the Meridian Distance will remain the same, therefore place against it the same Easting as for the preceding Course; from this subtract 39.95 the first Westing, and it leaves 44.77 for the sixth Course; from this subtract 23.75 the second Westing, and it leaves 21.02 for the seventh Course; from this subtract 21.02 the last Westing, and it leaves 0.0 to be set against the last course, which shows that the additions and subtractions have been accurately made. For as the Eastings and Westings equal each other, it is evident that one being added and the other subtracted, there will in the end be no remainder.

5. The next step in the process is to form a second departure Column, the numbers in which show the Sum of the Meridian Distances at the end of the first and second, second and third, third and fourth Courses, &c.

The first number in this Column will be the first in the other Departure Column; to which add the second number in that Column for the second in this; for the third add the second and third; and for the fourth the third and fourth; and so on till the Column be completed. *See* EXAMPLE I.

The first number to be placed in the second Departure Column is 20.74; to this add 45.12 and it makes 65.86 for the second number; to 45.12 add 75.16 and it makes 120.28 for the third number; to 75.16 add 84.72 and it makes 159.88 for the fourth number; to 84.72 add 84.72 and it makes 169.44 for the fifth number; to 84.72 add 44.77 and it makes 129.49 for the sixth number; to 44.77 add 21.02 and it makes 65.79 for the seventh number; to 21.02 add 0.0 and it makes 21.02 for the eighth number.

6. When the work is thus far prepared, multiply the several numbers in the second Departure Column, by the Northings or Southings standing against them respectively; place the Products of those multiplied by the Northings in the Column of North Areas, and of those multiplied by the Southings in the Column of South Areas; add up these two Columns and subtract the less from the greater; the Remainder will be double the Area of the Field, in Square Rods or Square Chains and Links, whichever measure was used in the Survey.

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Demonstration of the preceding Rules. *See* Plate III. *Fig.* 63. and Example 1.

The dotted Line A 2 represents the Northing, and the Line 2 B the Easting made by the first Course: These multiplied together, that is, 77.15×20.74=1600.0910, which is double the Area of the Triangle A 2 B, as is evident from the Rule to find the Area of a Triangle, Prob. IX. *Rule* 1. This number is to be placed for the first number in the Column of North Areas. The Line 3 C represents the Sum of the Eastings made by the first and second Courses, which is 45.12 the second number in the first Departure Column; if to this you add 20.74 the length of the Line 2 B you have 65.86, which is the second number in the second Departure Column, and which represents the Sum of the two Lines 3 C and 2 B. These two Lines with the Line 2, 3 which represents the Northing made by the second course, and the Line BC, one of the Sides of the Field, form a Right Angled Trapezoid. Now, by the Rule to find the Area of such a Trapezoid, *See* Prob. X. 65.86×31.66=2085.1276, double the Area of the Trapezoid 2 BC 3. Place this Product for the second number in the Column of North Areas.

To the Line 3 C add CD 30.04 the Easting made by the third Course, and you have 75.16 which is the Sum of the Eastings made by the three first Courses, and the third number in the first Departure Column. To this add 9.56 the Easting of the fourth Course, and you have 84.72 the length of the Line 1 E, which represents the Sum of the Eastings made by the four first Courses, and is the fourth number in the first Departure Column. These two, viz. the Lines 3 D 75.16 and 1 E 84.72 added together make 159.88 the fourth number in the second Departure Column; which being multiplied by 49.15 the length of the Line 3, 1 which represents the Southing made by the fourth Course, will give double the Area of the Trapezoid 1 ED 3. The number thus produced is 7858.1020, which is to be placed for the first number in the Column of South Areas.

The fifth Course being due South, it is evident the Sum of the Eastings will remain the same as at the end of the fourth Course; That is, the Line 4 F equals the Line 1 E, which is 84.72. These added make 169.44 the fifth number in the second Departure Column. This being multiplied by 54.10 the length of the Line EF, which is the Southing of the fifth Course as corrected in balancing, and the same as the Line 1, 4—will give double the Area of the Parallelogram 1 EF 4, which is 9166 .7040 the second number in the Column of South Areas.

From the Line AF 84.72 subtract 39.95 which is a West Course, and it leaves 4G 44.77 the Sum of the Eastings, or the Meridian Distance, at the end of the sixth Course, and the sixth number in the first Departure Column. From this subtract 23.75 the Westing made by the seventh Course, and you have 21.02 the length of the Line 5H, which is the Meridian Distance at the end of the seventh Course, and the seventh number in the first Departure Column. The Line 4G 44.77 added to the Line 5H 21.02 make 65.79 the seventh number in the second Departure Column. This being multiplied by 32.21 the length of the line 4, 5—which is the Southing of the seventh Course, will give double the Area of the Trapezoid 4GH5, which is 2119.0959 the third number in the Column of South Areas.

The Line H5, 21.02 is the Westing of the last Course, and the last number in the second Departure Column. This being multiplied by 26.65 the length of the Line 5 A, and the Northing of the last Course, produces 560

.1830, which is double the Area of the Triangle A5H, and the last number in the Column of North Areas.

Note. it will be observed that against the third and sixth Courses there are no Areas; the reason is that these Courses being one East and the other West, there is no Northing or Southing to be multiplied into them; regard can therefore be had to them only in forming the Departure Columns.

By inspecting the *Figure*, and attending to the preceding illustrations, it will be seen that the three North Areas represent double the Area of the Triangle A2B, the Trapezoid 2BC3, and the Triangle A5H, all of which are without the boundary Lines of the Field: Also, that the three South Areas represent double the Area of the Trapezoid 3DE1, the Parallelogram 1EF4, and the Trapezoid 4GH5; and that these include not only the Field but also what was included in the North Areas Therefore the North Areas subtracted from the South, the Remainder will be double the Area of the Field, contained within the black Lines.

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Additional Directions and Explanations.

The Northings and Southings may be added and subtracted instead of the Eastings and Westings; then there will be two Latitude Columns instead of Departure Columns; and the numbers in the second Latitude Column must be multiplied into the Eastings and Westings, and you will have East and West Areas.

When the Course is directly North or South, the Distance must be set in the North or South Column; When East or West, in the East or West Column. There will therefore sometimes be no number to be added to or subtracted from the number last set in the Latitude or Departure Column; then the number last placed in the Column must be brought down and set against such Course; as in EXAMPLE I. at the 5th Course. It may also sometimes be the Case that there will be no number to multiply into the number in the second Latitude or Departure Column; then that number must be omitted, and against such Course there will be no Area as in EXAMPLE I. at the 3d and 6th Courses.

When the Northings or Southings, Eastings or Westings, beginning at the top, will not admit of a continual addition of the one and subtraction of the other, without running out before you get through the several Courses, you may begin at such a Course as will admit of a continual addition and subtraction; and when you get to the bottom go the top, and you will end in Cypher at the Course next above that where you began; as in EXAMPLE II. which begins at the 9th Course to add the Eastings and subtract the Westings.

EXAMPLE II.

No.	Courses.	Dist. Rods	N.	S.	E.	W.	1 dep Col.	2 dep Col	North Areas	South Areas
1	N. 75° 0′ E.	54.8	14.2	. . .	52.9	. .	144.1	235.3	3341.26	. . . .
2	N. 20 30 E.	41.2	38.6	. . .	14.4	. . . .	158.5	302.6	11680.36	. . . .
3	East	64.8	......	. . .	64.8	. . .	223.3	381.8	. . . . . .	. . . .
4	S. 33 30 W.	141.2	......	117.7	. . .	77.9	145.4	368.7	. . . . . .	43395.99
5	S. 76 0 W.	64	......	15.5	. . .	62.1	83.3	228.7	. . . . . .	3544.85
6	North	36	36	. . .	. . .	. . .	83.3	166.6	5997.60	. . . .
7	S. 84 0 W.	46.4	......	49.	. . .	46.1	37.2	120.5	. . . . .	590.45
8	N. 53 15 W.	46.4	27.8	. . .	. . .	37.2	0.0	37.2	1034.16	. . . .
9	N. 36 45 E.	76.8	61.5	. . .	46	. . .	46	46	2829	. . . . .
10	N. 22 30 E.	56	51.7	. . .	21.4	. . .	67.4	113.4	5862.78	. . . . .
11	S. 76 45 E.	48	. . .	11	46.7	. . .	114.1	181.5	. . . . .	1996.50
12	S. 15 0 W.	43.4	. . .	41.9	. . .	11.2	102.9	217 .	. . . . .	9092.30
13	S. 16 45 W.	40.5	. . .	38.8	. . .	11.7	91.2	191.1	. . . . .	7531.08

Area 110 Acres, 2 Roods, 23 Rods.

Note. In the above EXAMPLE you might begin at the 4th Course to add the Westings and subtract the Eastings; or at the 6th Course to add the Northings and subtract the Southings; or at the 11th Course to add the Southings and subtract the Northings. So in every Survey some place may be found where you may begin to add and subtract, without running out before you get through all the Courses.

When a Field is very irregularly shaped, it will often happen that parts of the same Area will be contained in several different Products in the Columns of Areas; but in the final result, one column being subtracted from the other will leave what is included within the boundary Lines of the Field.

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DEMONSTRATION. *See* PLATE III. *Fig.* 64. *and* EXAMPLE II.

The Area standing against the 9th Course, which is where the calculation begins, is the Triangle 12K, all without the Field.

The Area against the 10th Course is the Trapezoid 2KL3, also without the Field.

The Area against the 11th Course is the Trapezoid 4ML3. This is a South Area, and contains a part of the Field and also part of the preceding North Area.

The Area against the 12th Course is the Trapezoid 5NM4, part within and part without the Field.

The Area against the 13th Course is the Trapezoid 6AN5, part within and part without the Field.

The Area against the 1st Course is the Trapezoid 6AB7, part within and part without the Field. This is a North Area and to be ultimately subtracted from the South Areas; but this includes a part of the preceding South Area, viz. the space nAso; it will however be seen hereafter that this same space is included in another South Area. This North Area contains also a part of the first North Area, viz. the space 6no7; but the same space is also included in another South Area.

The Area against the 2d Courses is also a North Area, and is the Trapezoid 7BC8. This Trapezoid contains the space sBCx, without the Field; the space osxw, within the Field; and the space 7ow8, without the Field. But the space osxw will be contained in the next South Area; and the space 7ow8, which was contained in the two first North Areas, will be contained in the next South Area.

By examining the whole *Figure* in this manner, it will be seen that the North Areas contain all without the Field that is taken into the Calculation, and some of it twice over; they also contain part of the Area within the Field. The South Areas contain all within the Field, and all without the Field that is contained in the North Areas. They also contain, twice over, so much of the Field as is included in any of the North Areas; and likewise, twice over, that part without the Field which is contained twice in the North Areas. So that subtracting the North from the South Areas leaves double the Area of the Field.

This method of calculating the Area of a Field by the Northings, Southings, Eastings and Westings, divides the

Field, with a certain quantity of the adjoining ground, into Right Angled Triangles, Right Angled Trapezoids, Parallelograms, or Squares, as may be seen by the *Figures*. It may therefore with propriety be called RECTANGULAR SURVEYING.

A USEFUL PROBLEM.

To find the true Area of a Field which has been measured by a Chain too long or too short.

Calculate the Area as if the Chain was of a true length, then institute the following Proportion:

As the Square of the length of the true Chain;
Is to the Area, as found by the Chain made use of;
So is the Square of the length of that Chain;
To the true Area of the Field.

EXAMPLE.

Suppose a Field, measured by a Two Rod Chain 3 Inches too long, is found to contain 41 Acres 1 Rood and 33 Rods, what is the true Area?

As the Square of 33 Feet, the true length of a Two Rod Chain; Is to 41 Acres 1 Rood and 33 Rods; So is the Square of 33 Feet 3 Inches, the length of the Chain used in the Survey; To 42 Acres and 13 Rods. 33 Feet=396 Inches. $396\times396=156816$ Square Inches.

41 Acres 1 Rood 33 Rods=6633 Rods.

33 Feet 3 Inches=399 Inches. $399\times399=159201$ square inches.

$159201\times6633\div156316=6733$ Rods.

$6733\div160=42$ Acres 13 Rods, the true Area.

PART II.

LAYING OUT LAND.

PROBLEM I. *To Lay out any number of Acres in the form of a Square.*

Annex 5 Cyphers to the number of Acres, which will turn them into Square Links, the Square Root of which will be the Side of the Square in Links.

EXAMPLE. It is required to lay out 810 Acres in the form of a Square.

Answer. Each Side of the Square must be 9000 Links, or 90 Chains.

PROBLEM II. *To lay out any number of Acres in the form of a Parallelogram, whereof one Side is given.*

Divide the number of Acres, when turned into Square

Links, by the given Side; the Quotient will be the Side required.

Example. What must be the longest side of a Parallelogram, which is to contain 25 Acres, when the shortest side is 5 Chains and 50 Links?

Answer. 2500000÷550=4545 Links for the longest Side.

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PROBLEM III. *To lay out any number of Acres in a Field,* 3, 4, 5, 6, *&c. times as long as it is broad.*

Divide the Acres, when turned into Square Links, by the proportion between the length and breadth; the Square Root of the Quotient will be the shortest Side.

Example. It is required to lay out 100 Acres 5 times as long as it is broad.

Answer. 10000000÷5=2000000 the Square Root of which is 1414 Links for the shortest Side, and the longest will be 7070 Links.

◆

PROBLEM IV. *To make a Triangle which shall contain a given number of Acres, being confined to a certain Base.*

Double the given number of Acres, to which annex 5 Cyphers, and divide by the Base; the Quotient will be the Perpendicular in Links.

Example. Upon a Base of 40 Chains to lay out 100 Acres in a Triangular form.

Answer. 5000 Links or 50 Chains will be the length of the Perpendicular.

The Perpendicular may be erected from any part of the Base: Thus, the Triangle ABC. *See* Plate II. *Fig.* 55. is the same as ABE, each containing 100 Acres.

When the given Base is so situated that a Perpendicular of sufficient length cannot be erected therefrom, continue the Base as from B to D. *Fig.* 56. from which erect the Perpendicular DC, and complete the Triangle ABC, which will contain 100 Acres.

PART III.

Dividing Land.

As different Fields are so variously, and many of them irregularly shaped, and as they are required to be divided in many different proportions, it is difficult to give Rules which will apply to particular cases. The business of dividing Land must therefore be left, in a great measure, to the skill and judgment of the Surveyor; who, if he is well acquainted with Trigonometry, and with measuring Land, will not find it difficult after a little practice, to divide a Field in such a manner as shall be desired. If he has before him a plot of the Field, and knows the number of parts into which it is to be divided, and the proportion which each part is to bear to the others, he will readily find out where the dividing Lines are to be drawn.

A few **Rules** and **Examples** will be given for the general instruction of the Learner.

PROBLEM I. *To cut off any number of Acres from a Square or Parallelogram.*

Say, as the whole number of Acres in the Field; Is to the length of the Square or length or breadth of the Parallelogram; So is the number of Acres proposed to be cut off; To their proportion of the length or breadth.

PROBLEM II. *To cut off any number of Acres by a Line proceeding from any Angle of a Triangle.*

Measure the Base, or Side opposite the Angle from which the dividing Line is to be drawn; Then say, As the number of Acres in the whole Triangle; Is to the whole Base; So is the given number of Acres; To their part of the Base.

Example. *See* **Plate** II. *Fig.* 57.

In the Triangle ABC, which contains 48 Acres, it is required to cut off 18 Acres, by a Line proceeding from C to the Base AB, which is 40 Chains.

As 48 : 40 : : 18 : 15

Lay 45 Chains on the Base from B to D, and draw the Line CD. The Triangle will then be divided as was proposed; BCD containing 18 Acres.

PROBLEM III. *To take off any given number of Acres from a multangular Field.*

Example I. *See* **Plate** III. *Fig.* 65.

Let ABCD, &c. be the Plot of a Field containing 11 Acres, from which it is required to cut off 5 Acres.

Join two opposite Corners of the Field as D and G, with the Line DG (which you may judge to be near the partition Line) and find the Area of the part DEFG, which suppose may want 140 Rods of the quantity proposed to be cut off. Measure the Line DG, which suppose to be 70 Rods; divide 140 by 35 the half of DG, and the Quotient 4 will be the length of a Perpendicular whose Base is 70 and the Area 140. Lay off 4 Rods from G to I, and draw the Line DI, which will be the dividing Line.

◆

EXAMPLE II. *See* PLATE III. *Fig.* 60.

Let ABCD, &c. be a Tract of Land to be divided into two equal parts, by a Line from I to the opposite Side CD: To find Arithmetically on what part of the Line CD the dividing Line IN will fall; or to find the Distance CN.

FIELD BOOK.

					Rods.						Rods.
AB.	N.	19°	0′	E.	108	GF.	West				70.9
BC.	S.	77	0	E.	91	GH.	N.	36	0	W.	47
CD.	S.	27	0	E.	115	HI.	North,				64.3
DE.	S.	52	0	W.	58	IA.	N.	62	15	W.	59
EF.	S.	15	30	E.	76						

Acres Rood Rods
Whole Area 152 — 1 — 25

Find the Area of the part IABCI, according to SECTION III. *Page* 57, as follows: Set the Latitude and Departure of the three first Sides IA, AB and BC in their proper Columns, in a Traverse Table; and place as much Southing, viz. 109.1 equal to the Line CK, and as much Westing, viz. 71.7 equal to the Line KI, as will balance the Columns. This Southing and Westing will be the Latitude and Departure made by the Line CI. The Area of IABCI will be found to be 8722 Rods, which is less than half the Area of the whole Field by 3470 Rods, the quantity to be contained in the Triangle ICN.

Find the Bearing and Distance of CI by RIGHT ANGLED TRIGONOMETRY, CASE IV. as follows:

As CK the Southing of CI, 109 - - - -	2.03743
: Radius - - - - - - -	10.00000
: : KI, the Westing of CI, 71.7 - - -	1.85552
	11.85552
	2.03743
: Tangent Course S. 33° 20′ W. - - -	9.81809
As Sine Course 33° 20′ - - - - - -	9.73997
Departure KI 71.7 - - - - - -	1.85552

: : Radius	10.00000
	11.85552
	9.73997
: Distance IC 130	2.11555

Note. In this way the Course and Distance may be found from one Angle of a Field to another.

Having found the Line CI divide 3470, the number of Rods to be contained in the Triangle ICN, by one half the line CI, viz. 65, the Quotient will be the length of the Perpendicular PN, viz. 53.4.

Now, by the Bearings of CI and CD it appears that they form an Angle of 60° 20'; wherefore in the Triangle CPN are given the side PN 53.4 and the Angle at C 60° 20', to find the Hypothenuse CN.

As Sine PCN 60° 20'	9.93898
: Side PN 53.4	1.72754
: : Radius	10.00000
	11.72754
	9.93898
: Hyp. CN 61.5	1.78856

Thus the dividing Line must go from I to a Point on the Line CD, which is 61.5 Rods from C. The Bearing and Distance of this Line may be found by the directions given above for finding the Bearing and Distance of the Line CI. Or, they may be found by Oblique Trigonometry Case III.

◆

Another method of finding the Distance CN.

Having ascertained the Latitude and Departure of the Line CI, set them down in a Traverse Table; find the Latitude and Departure of the Line CD, and place them in the Table; the Difference between the Northing of the Line IC and the Southing of the Line CD will be the Southing of the Line DI. viz. 6.6; and the Sum of the Eastings of those Lines, as they are both Easterly will be the Westing of the Line DI, viz. 123.9. Proceed to calculate the Area of the Triangle ICD, which will be found to be 6522 Rods, nearest.

Note. As in this Triangle two Sides and their contained Angle are given, the Area may be found by Prob. IX. *Rule* 4. *Page* 38.

Having found the Area of this Triangle, proceed to find CN according to PROB. II. *Page* 68, as follows:

As the Area of the Triangle; Is to CD the Base; So is the quantity to be contained in the Triangle ICN; To CN its proportion of the Base.

As 6522 : 115 : : 3470 : 61.2

A third method of finding the Distance CN.

To the Logarithm of double the Area to be contained within the Triangle ICN add Radius; from this Sum subtract the Logarithmic Sine of the angle at C; and from the Remainder subtract the Logarithm of the Side IC; the last Remainder will be the Logarithm of the Side CN.

The double Area of the Triangle ICN is 6940; the Angle at C is 60° 20'; the Side IC is 130.

Double Area 6940 -	3.84136
Radius - - -	10.00000
	13.84136
Sine ICN 60° 20'	9.93898
	3.90238
Side IC 130 - -	2.11394
Side CN 61.5 -	1.78844

Note. Radius may be added by placing a Unit before the Index of the Logarithm for the double Area, without the trouble of setting down the Cyphers.

By Natural Sines.

Divide the Double Area by the Natural Sine of the given Angle, and that quotient by the given Side; the last Quotient will be the Side CN.

Nat. Sine of the Angle at C 60° 20' 0.86892

6940÷0.86892=7986.92

7986.92÷130=61.43

◆

From the above the following general Rule may be drawn.

To find the Side of a Triangle when the Area is given, with one of the Sides and the Angle contained between the given Side and the Side required.

To the Logarithm of double the Area add Radius; from this Sum subtract the Logarithmic Sine of the given Angle, and from the Remainder subtract the Logarithm of the given Side; the last Remainder will be the Logarithm of the Side required.

Or, *By Natural Sines*: Divide the double Area by the Nat. Sine of the given Angle, and that Quotient by the given Side; the last Quotient will be the Side required.

◆

CONCLUDING REMARKS.

Other methods of surveying Fields are taught by some authors on this subject. The preceding, however, will be found most useful in actual practice. Other instruments besides those mentioned in this Book are also sometimes used; such as the Plain Table, Semicircle, Perambulator, Theodolite, &c. But of these instruments very little use is made in New-England; and they are not often to be met with. For general practice none will be found more useful than a common Chain, and a Compass upon Rittenhouse's construction. A Surveyor should also provide himself with an Offset Staff, ten Links in length, and accurately divided into Links. This should be made of firm hard wood, and will be found very convenient in taking Offsets, and also in measuring the Chain; which should be often done, as from a variety of causes a Chain is liable to become inaccurate.

It will be observed that in this Work there are no descriptions of Mathematical and Surveying instruments. The Compiler omitted such descriptions from a belief that nothing which can be written on the subject will enable a person to understand them without an actual inspection of the instruments themselves, and some instruction from those acquainted with them.

The general principles here taught may be applied to the surveying of Townships, Roads, Rivers, Harbors, &c.

APPENDIX.

OF THE VARIATION OF THE COMPASS AND ATTRACTION OF THE NEEDLE.

THE Variation of the Compass is the number of Degrees that the Magnetic Needle points from the true North, either East or West. This differs in different places, and in the same place at different times. It is, at present, in Connecticut, a few degrees to the Westward. That is, the Needle points to the Westward of North, and is gradually approaching the true North.

The following method of ascertaining the Variation, by the North Star, has been adopted by many Surveyors, as the most eligible to be practised on Land. It was communicated to the Compiler by Moses Warren, jun. Esq. of Lyme, an experienced Surveyor, with permission to publish it.

The Star commonly called the North Star, is not directly North but revolves round the Pole in a small circle, once in 24 hours. It cannot therefore be due North but twice in that period ; and that is within a very few minutes of the time when a Star, called *Alioth*, in the Constellation of Ursa Major, or the Great Bear, is directly over or under it. There is also another Star nearly in an opposite direction from the Pole, called *Gamma*, in the Constellation of Cassiopeia. When these three Stars are vertical the North Star is very near the Meridian ; and when they are horizontal, it is at its greatest Elongation, that is, at its greatest distance East or West of the Pole, and on the same side as the Star in Cassiopeia. The Variation may be calculated when the Star is on the Meridian, or when at its greatest Elongation ; more accurately, however, at the latter period, because its motion being then nearly vertical for some time gives the observer a better opportunity to complete his observation.*

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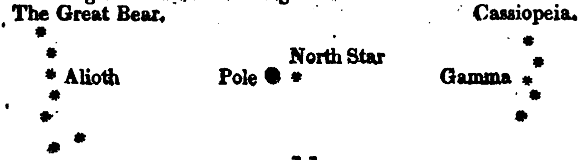
* The following Figure exhibits a view of the relative situation of these Stars as they appear, when in a horizontal position : or when the North Star is in its greatest Eastern Elongation.



To find the Elongation of this Star in any Latitude, its Declination must be known; that is, its distance North of the Equator. This being found, institute the following Proportion:

As Co-Sine of the Latitude; Is to Radius; So is Co-Sine of the Declination; to Sine of the Elongation.

The Declination of the North Star, January 1, 1810, was 88° 17′ 28″, and increasing at the rate of about 19 seconds and one half annually.

The following Table shews the Elongation, in several different Latitudes, for 5 years successively. It is calculated for the first of January in each year; and in using it, if the time, when the Elongation is required, be past the middle of the year, take it for the beginning of the next year.

A Table showing the Elongation of the North Star.

Latitude.	1820	1821	1822	1823	1824
38°	2° 5′ 34″	2° 5′ 7″	2° 4′ 39″	2° 4′ 13″	2° 3′ 47″
39	2 7 23	2 6 54	2 6 25	2 5 59	2 5 33
40	2 9 12	2 8 41	2 8 14	2 7 46	2 7 20
41	2 11 11	2 10 40	2 10 12	2 9 44	2 9 18
42	2 13 10	2 12 39	2 12 11	2 11 43	2 11 16
43	2 15 22	2 14 51	2 14 22	2 13 54	2 13 26
44	2 17 33	2 17 4	2 16 34	2 16 5	2 15 37

The Elongation for the Latitude of the observation being calculated, or taken from the above Table, proceed to find its range, according to the following directions:

Take a pole 18 or 20 feet in length; to the end of it fasten a small line; raise it to an elevation of 45° or 50°: and support it by two crotches of a suitable height to keep it firm in its place. At the end of the line, near the ground, fasten a weight of half a pound or more, which should swing in water to prevent the air from moving the line. Southward of the line, fix a Compass sight, or other piece of metal or wood, with a narrow, perpendicular aperture at a convenient height from the ground, say about 2 or 2 1-2 feet; and let it be so fixed that it can be moved a small distance East or West at pleasure. Let an assistant hold a light either NE. or NW. of the line, nearly as high as the range from the sight to the North Star, in such a position that the line may be plainly seen; then, (the three Stars above mentioned being parallel or nearly so with the Horizon) move the sight-vane East or West, until through the aperture, the line is seen to cut the Star; and continue to observe, at short intervals, till the Star is seen at its greatest Elongation. Let a lighted candle be placed in an exact range with the sight-vane and line at the distance of 20 Rods or more, which should stand perpendicularly, be made fast, extinguished and left till morning. Then the sight-vane, the line and the candle will be the range of Elongation, which observe accurately with a Compass; and if the Elongation be East and the Variation West, the former must be subtracted from the latter; and if they are both West they must be added, and their difference or sum will be the true Variation.

* * *

OF THE ATTRACTION OF THE NEEDLE.

It is well known that any Iron substance has an influence upon the magnetic Needle, attracting it one way or the other from the point where it would settle, were there no such attraction. A Surveyor should therefore be careful to see that no Iron is near the Compass when taking a Bearing. But as the Earth in certain spots contains, near its surface, Iron or other minerals which attract the Needle, it will frequently happen that it will point wrong. To ascertain whether this is the case, the Surveyor, at each station, should take a back view of the one last left; and if he finds that the Compass does not reverse truly, he may be sure, provided the Compass be accurately graduated and placed horizontally, that he either made a mistake at the last station, or that in one or the other of the stations, the Needle was attracted from the true point. When he finds a place where he suspects there is an attraction he should go a few rods backward or forward, and see whether the Needle points differently. In this way he may prevent mistakes in his Field notes, by putting down a wrong course. To take back sights is particularly necessary in running long Lines, and laying out new Lands; where the Needle is the only thing to guide the Surveyor.

By practice and experience a knowledge will be acquired on this subject, and with regard to many other things in Surveying, which cannot be taught by Books; and after all the directions which can be written the Practitioner will frequently find occasion for the exercise of his own judgment.

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A Rule to find the difference between the present Variation of the Compass, and that at a time when a Tract was formerly surveyed, in order to trace or run out the original lines.

Go to any part of the premises where any two adjacent corners are known; and if one can be seen from the other, take their bearing; which, compared with that of the same line in the former survey, shows the difference. But if one corner cannot be seen from the other, run the line according to the given bearing, and observe the nearest distance between the line so run and the corner: then work by the following proportion;

As the length of the whole line,
Is to 57.3 Degrees,*
So is the said Distance,
To the difference of Variation required.

EXAMPLE.

Suppose it be required to run a line which some years ago bore N. 45° . E. distance 20 Chains, and in running this line by the given bearing, the corner is found 20 Links to the left hand; what is the present bearing of this line?

```
     Ch.     Deg.     L.
  As 20   :  57.3 : : 20
     100     20
     ----    ------
     2000    1146.0
               60
             ------
  2000)68760(34 Minutes.
```

Answer 34 Minutes to the left hand is the allowance required, and the line in question bears N. 44° 26' E.

◆

The Compiler of this work acknowledges himself under obligations to George Gillett, Esq. Surveyor General of the State of Connecticut, for the following illustrations, remarks, and miscellaneous questions, considering them calculated to be useful to the learner, and the practical Surveyor. They came to hand too late to be inserted in their proper places, in the body of the work, and are here put together in the Appendix.

The following method, called the Pennsylvania method, of computing the meridian distances is practised by many Surveyors, and is thought by some preferable to that taught in this book. The result however is the same.

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* 57.3 Degrees is the Radius of a Circle (nearly) in such parts as the Circumference contains 360.

The following is the example on page 58.

PENNSYLVANIA METHOD.

N.	S.	E.	W.	Merid. Dist.
77.15		20.74		20.74 41.48
31.66		24.38		65.86 90.24
		30.04		120.28 150.32
	49.15	9.56		159.88 169.44
	54.10			169.44 169.44
			39.95	129.49 89.54
	32.21		23.75	65.79 42.04
26.65			21.02	21.02 00.00

By this method, only one column is used for the Meridian Distances. The first easting 20.74 is set at the head of the column and added to itself, which makes 41.48. To this sum the next easting 24.38 is added, which makes 65.86. To this sum the same easting is added again, and in like manner the remainder of the eastings are added and the westings are subtracted, twice against each station, and the last subtraction ends in 0.00 or cypher. The upper number against each station in the column of Merid. Dist. is exactly the same as the number in the second departure Column in the preceding method.

DIRECTIONS FOR USING THE COMPASS, AND CONCERNING ATTRACTIONS OF THE NEEDLE.

In all cases the surveyor ought to set his compass at least twice on each line, even if he has a fair view of the whole length of it.

When there are local attractions, and no two places are found, on the same line where the compass has the same traverse, the surveyor should take a medium and enter in his field book, noting such courses, as he may still have occasion to correct them in his calculations. If in such cases he is at a loss what course to enter in his field book, and suspects that some minutes may be added to or subtracted from the course he enters in his book, let him prefix to such courses the sign of addition or subtraction as the case may be, which will often assist him in balancing his surveys.

CONCERNING DRAWING A MAP OF A FIELD.

When a map is to be made of a multangular piece of land, whether a calculation or division is to be made from it, the surveyor should measure across the lot in some central place at least once, and in more places if convenient and the case may require it. By cross measures, the map will be made more correct. The surveyor should not be afraid of wearing his chain by measuring too much. When a survey is to be calculated by plotting, it should not be laid on a scale less than ten rods to an inch.

REMARKS ON BALANCING A SURVEY.

In every survey which is accurate, the sum of the Northings will equal that of the Southings, and the Eastings will equal the Westings; but this is not always an infallible proof that the survey is accurate, for two errors may be committed, one exactly to balance the other, which no rule will detect; but such cases do not often occur. In a survey of one hundred acres, whatever may be the number of the angles, the difference between the two columns of Latitude and those of Departure, ought not to exceed a rod for each, but to come within these limits if possible.

If in such a survey either of the differences should exceed a rod, where the land is valuable and easily surveyed, it would be better to take a re-survey, or so far as to detect the error.

Some authors have given rules for balancing surveys, which are indiscriminately applied to every line in the survey, which presupposes that a proportional error must have been committed on each and all, both in courses and distances, when in almost every survey, a part of the lines are on land so level and so clear from obstructions of any kind, that if the surveyor and chainmen attend to their business, they will not be likely to commit much error on them; while other lines, on other parts of the same survey, are attended with so many difficulties, that when they have done their best, it will scarcely be possible for them to avoid some error, and the surveyor who takes the survey will best judge on what lines the errors were committed, and whether they are in the courses or in the distances. In all cases the corrections should be made on the lines containing the errors. When the errors are in the courses they should be corrected, and when the errors are in the distances, the correction should be in them: or the corrections may be in both courses and distances as the surveyor may judge proper.

When a course is northwesterly and southeasterly, or northeasterly and southwesterly, if the correction of it increases the latitude and diminishes the departure, or if it diminishes the latitude and increases the departure, so as to bring the differences to a mean balance, it is good evidence that the course contains some error.

CONVERGING OF MERIDIANS.

The breadth of a degree of longitude in any parallel of latitude is to the breadth of a degree upon the equator, as the Co-sine of that latitude is to Radius.

R. : 60 Miles : : Co-Sine of the Lat. : the breadth of a degree on that Lat.

As Radius, . . .	10.00000
Is to 60 Miles, . . .	1.77815
So is Co Sine Lat. 60° . .	9.69897
	11.47712
	10.00000
To 30 Miles, . . .	1.47712

MISCELLANEOUS QUESTIONS.

1. At a certain point I took the elevation of a tower 3° 15′—then measured towards the tower on an angle of depression 7° 333 feet to a level with the base of the tower, when I took the elevation again 8°.—Required the height of the tower and the distance from the second place of observation to the base; also how much higher the land was at the place of the first observation than at the second.

Ans.—Height, . . . 99.6 *feet.*
Distance required, . . 708.6 *feet.*
Difference in the height of land, 40.58 *feet.*

2. Two persons made observations on the altitude of a meteor, both being on the same side of it, and in a vertical plane passing through it. The distance of their stations were 200 rods apart, and at one the angle of elevation was 36° 25′, at the other 32° 50′, and at the last the outer limb of the meteor subtended an angle of 2′.—Required the distance from the last place of observation, also the height and diameter of it.

M. *Q.* *R.*
Answer.—The distance, 5 .. 3 .. 60
Height, 3 .. 0 .. 70
Diameter, 18 *feet* 2 *inches.*

3. From the top of a steeple 165 feet high, the angle of depression of the nearest bank of a river is 11° 15′, that of the opposite bank is 6° 15′. Required the width of the river. *Answ.* 41.13 *rods.*

4. What length of cart tire will it take to band a wheel 5 feet in diameter? *Answ.* 15 *feet* 8 1-2 *inches.*

5. A gentleman laid out a garden in a circle, containing one acre, one quarter, and one rod, with a gravelled walk on the outer side of it within the circle which took up twelve rods of ground. What is the diameter of the circle, and what is the width of the walk?

Answ. The diameter 16 *rods—Width of the walk* 4 *feet.*

6. Neptune laid out 1000 square miles of the surface of the sea in a circle, and sold to Aeolus all that part of it which lies without a concentric circle of one third of the diameter. What is the diameter, and how much was sold? *Answ. The diameter* 35.68 *miles.*
The quantity sold 888.92 *square miles.*

7. A Farmer laid out an elliptical orchard, the longest diameter of which was 30 rods, and the shortest was 20 rods, and surrounded the same with a wall two feet thick, within the figure. What is the quantity within the wall, and how much is covered by it?

A. *Q.* *R.*
Answ. Within the wall 2 .. 3 .. 22
Covered by the wall, 9.3 *rods.*

8. From a point in an equilateral triangle, I measured the distances to each corner, and found them 20, 29, and 30 rods. Required the area and the length of the sides.

A. Q. R.
Answ. The area 5 .. 1 .. 33
Length of each side 45 *rods.*

9. Required the dimensions of a parallelogram, containing one acre and a half, bounded by 64 rods of fence. *Answ.* 12 *by* 20 *rods.*

10. The area of a parallelogram is five acres one quarter and thirty-five rods, and the diagonal is forty-three rods. Required the length of the sides. *Answ.* 35 *by* 25 *rods.*

11. Required the dimensions of a parallelogram containing twenty-six acres one quarter and twenty-four rods, when the length exceeds the breadth by fifty-two rods. *Answ.* 44 *by* 96 *rods.*

12. Required the dimensions of a parallelogram containing 250 acres, when the sides are in the proportion of 7 to 3.

Answ. 130.93 *by* 305 1-2.

13. The state of Connecticut contains a little upwards of 4828 square miles, or 3,090,000 acres, including rivers, harbours, creeks, roads, &c. if this quantity of land is laid in a square, what will be the length of each side?

M. *Q.* *R.*
Answ. 69 .. 1 .. 75.11

Note. In the Preface, it is observed that the Traverse Table in this book is calculated for any distance up to 50. After the Preface was printed, it was thought best to extend that Table to 70. The Table of Logarithms is also much more extensive, than is noticed in the Preface.

MATHEMATICAL TABLES.

VIZ :

I. *A Table of Logarithms for Numbers.*
II. *A Table of Logarithmic or Artificial Sines, Tangents, and Secants.*
III. *A Traverse Table, or Table of Difference of Latitude and Departure.*
IV. *A Table of Natural Sines.*

I. A TABLE OF LOGARITHMS FOR NUMBERS.

Logarithms are Numbers in Arithmetical Progression, corresponding to other Numbers in Geometrical Proportion.

As,	0.	1.	2.	3.	4.	Logarithms.
	1.	10.	100.	1000.	10000.	Numbers.

The Logarithm for any Number less than 10 is a certain number of Decimals; for any Number between 10 and 100, it is 1 with Decimals; for any Number between 100 and 1000, it is 2 with Decimals, &c. The whole Number in Logarithms, or the Number which stands at the left hand of the Decimal point, is called the Index; and is always a unit less than the places of figures in the whole Number for which it is the Logarithm: Thus,

The Log. of	6543	is	3.81578
	654.3	-	2.81578
	65.43	-	1.81578
	6.543	-	0.81578

The Log. of a Decimal Fraction is the same as that of an Integer, only the Index is negative, and is distinguished from a positive one, by placing a Point, or a negative Sign before it: Thus,

The Log. of	0.6543	is	.9.81578 or — 1.81578.
	0.06543	-	.8.81578 or — 2.81578.

Note.—In the following Table the Index is not prefixed. It may be easily supplied as it is always a unit less than the number of figures in the corresponding natural whole number.

To find the Logarithm of any Number.

If the Number is less than 100, its Log. is found in the first page of the Table, directly opposite thereto: Thus, the Log. of 34 is 1.53148.

If the Number consists of three figures, find it in the first column of the following part of the Table, opposite to which, and under 0, is the Log.: Thus the Log. of 346 is .53908 to which prefix 2 for the Index, because there are three places of figures in the whole Number.

If the given Number contains four figures, the first three are to be found, as before, in the side column, and under the fourth at the top of the table is the Log. to which the Index 3 is to be prefixed, if the given Number is an Integer: Thus the Log. of 3467 is .53995 to which prefix 3 for the Index.

If the given Number exceeds four figures, find the difference between the Log. of the first four figures, and the next following Log. Multiply this difference by the remaining figure or figures in the given Number; point off as many figures to the right hand as there are in the multiplier; and the remainder, added to the Log. of the first four figures, will be the required Log.

To find the Number corresponding to any given Logarithm.

Find the next less Log. to that given in the column marked 0 at the top, and continue the sight along that horizontal line, and the Log. the same as that gives, or very near it, will be found; then the first three figures of the corresponding Number will be found opposite, in the first side column, and the fourth figure directly above, at the top of the page. If the Index of the given Log. is 3, the four figures thus found are whole numbers; if the Index is 2, the first three figures are whole numbers, and the fourth is a Decimal, and so on.

To find the nearest number corresponding to any Log. for more than four figures, find the Log. next less than the given one, and take the difference between that and the given one; also take the difference between the next greater and the next less Log. than the given one; divide the former difference by the latter, according to the Rule in Division of Decimals for dividing a less number by a greater; add the Quotient to the number answering to the Log. next less than the given one, and you will have the required Number; whether a whole, or a mixed Number will be determined by the Index.

The addition and subtraction of Logarithms answers the same purpose as the multiplication and division of their corresponding Numbers: That is, the Log. of any two Numbers being added, their Sum will be the Log. of the Product of those Numbers; and the Log. of one Number being subtracted from the Log. of another Number, the Remainder will be the Log. of the Quotient of one of those Numbers divided by the other. Again, the Log. of any Number being doubled will produce the Log. of the Square of that number; and one half the Log. of any Number is the Log. of the Square Root of that Number.

◆

II. *Of the Table of Logarithmic or Artificial Sines, Tangents, and Secants.*

To find the Logarithmic Sine, &c. for any number of Degrees and Minutes, within the compass of the Table.

If the Degrees be less than 45, look for them at the top of the Columns, and under Sine, Tangent or Secant, whichever is wanted, and for the Minutes at the left hand; but if more than 45, look for the Degrees at the Bottom over Sine, &c. and for the Minutes at the Right hand; under or over the Degrees and against the Minutes will be the required Log. Sine, &c.

To find the Degrees and Minutes corresponding to a given Logarithmic Sine, &c.

Look in the proper Column for the nearest Log. to the given one; and the Degrees and Minutes standing over or under and against it, are those required.

Note. When the Log. Sine, &c. for more than 90° is required, subtract the given number of Degrees from 180° and make use of the Remainder.

It will be observed that this Table is calculated only for every 5 Minutes. This was thought sufficient for Surveyors, as few Compasses will take a course to greater exactness. If however a Question is to be solved where greater accuracy is required, work by natural Sines. Or,

The Log. Sine, &c. for any Minnte may be found as follows:

Look in the Table for the Log. of the nearest number of Minutes greater than the given one, and from this subtract the next less Log. contained in the Table: Then say, as 5 Minutes, Is to this difference; So is the excess of the given Minutes above 5, 10, 15, 20, 25, &c; To a fourth number, which add to the Log. of the Minutes next less than the given number, and the sum will be the Log. required.

EXAMPLE.

Required the Logarithmic Sine of 34° 23'

Sine of 34° 25'	9.75221
34 20	9.75128
Difference	93

As 5 : 93 : : 3 : 56

Sine of 34° 20'	9.75128
Add - -	56
Sine of 34° 23'	9.75184

To find the nearest Minutes corresponding to a given Logarithmic Sine, &c.

Look in the Table, in the proper Column, for the Log. next less than the given one, and take the difference between that and the given one ; also take the difference between the next greater and the next less Log. than the given one ; Then say, As the latter difference ; Is to 5 Minutes ; So is the former difference ; To the number of Minutes to be added to the Minutes of the Log. next less than the given one.

EXAMPLE.

Required the Degrees and Minutes corresponding to the Logarithmic Tangent 9.73597.

Given Log.	9.73597	Next greater Log.	9.73627
Next less	9.73476	Next less -	9.73476
Difference	121	Difference	151

As 151 : 5 : : 121 : 4

The Degrees and Minutes for the Log. next less than the given one are 28° 30' to which add 4' and it makes 28° 34'.

Note. As after the most careful attention of the Printers, some figures in the Table may be wrong ; and as some may be so blurred as to be illegible, let it be observed, that the Sines and Co-Secants, the Co-Sines and Secants, and the Tangents and Co-Tangents, standing against each other respectively, being added together, will amount to 20.00000, if the Tables are accurate. Thus against 28° 20' the Sine 9.67533 added to the Co-Secant 10.32367 their Sum is 20.00000; so also is the Sum of the Co-Sine 9.94458 and the Secant 10.05542, and likewise the sum of the Tangent 9.73175 and the Co-Tangent 10.26825. An error may consequently be easily detected, or any defaced figure be supplied.

To calculate the Northing or Southing, &c. for any Course and Distance by Logarithms.

This is done by the first CASE of RIGHT ANGLED TRIGONOMETRY, as follows:

Find the Log. Sine and Co-Sine of the Course; to each of these add the Log. of the Distance; subtract Radius or 10.00000 from their Sums, and the Remainders will be the Log. of the required Latitude and Departure.

Note. When the Angle is very small or very large, and the Distance short, the sum of the Log. Sine or Co-Sine and the Log. of the Distance may be less than 10.00000 or Radius, which cannot therefore be subtracted. In such cases look for the Log. without regard to the Index, and the corresponding number will be a Decimal, the first Figure of which will be Tenths if the Index be 9, and Hundredths if the Index be 8.

A TABLE OF LOGARITHMS.

No. 1——100. Log 0.00000——2.00000.

N.	Log.	N.	Log.	N.	Log.	N.	Log.	N.	Log.
1	0.00000	21	1.32222	41	1.61278	61	1.78533	81	1.90849
2	0.30103	22	1.34242	42	1.62325	62	1.79239	82	1.91381
3	0.47712	23	1.36173	43	1.63347	63	1.79934	83	1.91908
4	0.60206	24	1.38021	44	1.64345	64	1.80618	84	1.92428
5	0.69897	25	1.39794	45	1.65321	65	1.81291	85	1.92942
6	0.77815	26	1.41497	46	1.66276	66	1.81954	86	1.93450
7	0.84510	27	1.43136	47	1.67210	67	1.82607	87	1.93952
8	0.90309	28	1.44716	48	1.68124	68	1.83251	88	1.94448
9	0.95424	29	1.46240	49	1.69020	69	1.83885	89	1.94939
10	1.00000	30	1.47712	50	1.69897	70	1.84510	90	1.95424
11	1.04139	31	1.49136	51	1.70757	71	1.85126	91	1.95904
12	1.07918	32	1.50515	52	1.71600	72	1.85733	92	1.96379
13	1.11394	33	1.51851	53	1.72428	73	1.86332	93	1.96848
14	1.14613	34	1.53148	54	1.73239	74	1.86923	94	1.97313
15	1.17609	35	1.54407	55	1.74036	75	1.87506	95	1.97772
16	1.20412	36	1.55630	56	1.74819	76	1.88081	96	1.98227
17	1.23045	37	1.56820	57	1.75587	77	1.88649	97	1.98677
18	1.25527	38	1.57978	58	1,76343	78	1.89209	98	1.99123
19	1.27875	39	1.59106	59	1.77085	79	1.89763	99	1,99564
20	1.30103	40	1.60206	60	1.77815	80	1.90309	100	2.00000

A TABLE OF LOGARITHMS.

No. 100——1600. Log. 00000——20412.

No.	0	1	2	3	4	5	6	7	8	9
100	00000	00043	00087	00130	00173	00217	00260	00303	00346	00389
101	0432	0475	0518	0561	0604	0647	0689	0732	0775	0817
102	0860	0903	0945	0988	1030	1072	1115	1157	1199	1242
103	1284	1326	1368	1410	1452	1494	1536	1578	1620	1662
104	1703	1745	1737	1828	1870	1912	1953	1995	2036	2078
105	2119	2160	2202	2243	2284	2325	2366	2407	2449	2490
106	2531	2572	2612	2653	2694	2735	2776	2816	2857	2898
107	2938	2979	3019	3060	3100	3141	3181	3222	3262	3302
108	3342	3383	3423	3463	3503	3543	3583	3623	3663	3703
109	3743	3782	3822	3862	3902	3941	3981	4021	4060	4100
110	4139	4179	4218	4258	4297	4336	4376	4415	4454	4493
111	4532	4571	4610	4650	4689	4727	4766	4805	4844	4883
112	4922	4961	4999	5038	5077	5115	5154	5192	5231	5269
113	5308	5346	5385	5423	5461	5500	5538	5576	5614	5652
114	5690	5729	5767	5805	5843	5881	5918	5956	5994	6032
115	6070	6108	6145	6183	6221	6258	6296	6333	6371	6408
116	6446	6483	6521	6558	6595	6633	6670	6707	6744	6781
117	6819	6856	6893	6930	6967	7004	7041	7078	7115	7151
118	7188	7225	7262	7298	7335	7372	7408	7445	7482	7518
119	7555	7591	7628	7664	7700	7737	7773	7809	7846	7882
120	7918	7954	7990	8027	8063	8099	8135	8171	8207	8243
121	8279	8314	8350	8386	8422	8458	8493	8529	8565	8600
122	8636	8672	8707	8743	8778	8814	8849	8884	8920	8955
123	8991	9026	9061	9096	9132	9167	9202	9237	9272	9307
124	9342	9377	9412	9447	9482	9517	9552	9587	9621	9656
125	9691	9726	9760	9795	9830	9864	9899	9934	9968	10003
126	10037	10072	10106	10140	10175	10209	10243	10278	10312	0346
127	0380	0415	0449	0483	0517	0551	0585	0619	0653	0687
128	0721	0755	0789	0823	0857	0890	0924	0958	0992	1025
129	1059	1093	1126	1160	1193	1227	1261	1294	1327	1361
130	1394	1428	1461	1494	1528	1561	1594	1628	1661	1694
131	1727	1760	1793	1826	1860	1893	1926	1959	1992	2024
132	2057	2090	2123	2156	2189	2222	2254	2287	2320	2352
133	2385	2418	2450	2483	2516	2548	2581	2613	2646	2678
134	2710	2743	2775	2808	2840	2872	2905	2937	2969	3001
135	3033	3066	3098	3130	3162	3194	3226	3258	3290	3322
136	3354	3386	3418	3450	3481	3513	3545	3577	3609	3640
137	3672	3704	3735	3767	3799	3830	3862	3893	3925	3956
138	3988	4019	4051	4082	4114	4145	4176	4208	4239	4270
139	4301	4333	4364	4395	4426	4457	4489	4520	4551	4582
140	4613	4644	4675	4706	4737	4768	4799	4829	4860	4891
141	4922	4953	4983	5014	5045	5076	5106	5137	5168	5198
142	5229	5259	5290	5320	5351	5381	5412	5442	5473	5503
143	5534	5564	5594	5625	5655	5685	5715	5746	5776	5806
144	5836	5866	5897	5927	5957	5987	6017	6047	6077	6107
145	6137	6167	6197	6227	6256	6286	6316	6346	6376	6406
146	6435	6465	6495	6524	6554	6584	6613	6643	6673	6702
147	6732	6761	6791	6820	6850	6879	6909	6938	6967	6997
148	7026	7056	7085	7114	7143	7173	7202	7231	7260	7289
149	7319	7348	7377	7406	7435	7464	7493	7522	7551	7580
150	7609	7638	7667	7696	7725	7754	7782	7811	7840	7869
151	7898	7926	7955	7984	8013	8041	8070	8099	8127	8156
152	8184	8213	8241	8270	8298	8327	8355	8384	8412	8441
153	8469	8498	8526	8554	8583	8611	8639	8667	8696	8724
154	8752	8780	8808	8837	8865	8893	8921	8949	8977	9005
155	9033	9061	9089	9117	9145	9173	9201	9229	9257	9285
156	9312	9340	9368	9396	9424	9451	9479	9507	9535	9562
157	9590	9618	9645	9673	9700	9728	9756	9783	9811	9838
158	9866	9893	9921	9948	9976	20003	20030	20058	20085	20112
159	0140	20167	0194	0222	0249	0276	0303	0330	0358	0385
No.	0	1	2	3	4	5	6	7	8	9

No. 1600——2200. Log. 20412——34242.

No.	0	1	2	3	4	5	6	7	8	9
160	20412	20439	20466	20493	20520	20548	20575	20602	20629	20656
161	0683	0710	0737	0763	0790	0817	0844	0871	0898	0925
162	0952	0978	1005	1032	1059	1085	1112	1139	1165	1192
163	1219	1245	1272	1299	1325	1352	1378	1405	1431	1458
164	1484	1511	1537	1564	1590	1617	1643	1669	1696	1722
165	1748	1775	1801	1827	1854	1880	1906	1932	1958	1985
166	2011	2037	2063	2089	2115	2141	2167	2194	2220	2246
167	2272	2298	2324	2350	2376	2401	2427	2453	2479	2505
168	2531	2557	2583	2608	2634	2660	2686	2712	2737	2763
169	2789	2814	2840	2866	2891	2917	2943	2968	2994	3019
170	3045	3070	3096	3121	3147	3172	3198	3223	3249	3274
171	3300	3325	3350	3376	3401	3426	3452	3477	3502	3528
172	3553	3578	3603	3629	3654	3679	3704	3729	3754	3779
173	3805	3830	3855	3880	3905	3930	3955	3980	4005	4030
174	4055	4080	4105	4130	4155	4180	4204	4229	4254	4279
175	4304	4329	4353	4378	4403	4428	4452	4477	4502	4527
176	4551	4576	4601	4625	4650	4674	4699	4724	4748	4773
177	4797	4822	4846	4871	4895	4920	4944	4969	4993	5018
178	5042	5066	5091	5115	5139	5164	5188	5212	5237	5261
179	5285	5310	5334	5358	5382	5406	5431	5455	5479	5503
180	5527	5551	5575	5600	5624	5648	5672	5696	5720	5744
181	5768	5792	5816	5840	5864	5888	5912	5935	5959	5983
182	6007	6031	6055	6079	6102	6126	6150	6174	6198	6221
183	6245	6269	6293	6316	6340	6364	6387	6411	6435	6458
184	6482	6505	6529	6553	6576	6600	6623	6647	6670	6694
185	6717	6741	6764	6788	6811	6834	6858	6881	6905	6928
186	6951	6975	6998	7021	7045	7068	7091	7114	7138	7161
187	7184	7207	7231	7254	7277	7300	7323	7346	7370	7393
188	7416	7439	7462	7485	7508	7531	7554	7577	7600	7623
189	7646	7669	7692	7715	7738	7761	7784	7807	7830	7852
190	7875	7898	7921	7944	7967	7989	8012	8035	8058	8081
191	8103	8126	8149	8171	8194	8217	8240	8262	8285	8307
192	8330	8353	8375	8398	8421	8443	8466	8488	8511	8533
193	8556	8578	8601	8623	8646	8668	8691	8713	8735	8758
194	8780	8803	8825	8847	8870	8892	8914	8937	8959	8981
195	9003	9026	9048	9070	9092	9115	9137	9159	9181	9203
196	9226	9248	9270	9292	9314	9336	9358	9380	9403	9425
197	9447	9469	9491	9513	9535	9557	9579	9601	9623	9645
198	9667	9688	9710	9732	9754	9776	9798	9820	9842	9863
199	9885	9907	9929	9951	9973	9994	30016	30038	30060	30081
200	30103	30125	30146	30168	30190	30211	0233	0255	0276	0298
201	0320	0341	0364	0384	0406	0428	0449	0471	0492	0514
202	0535	0557	0578	0600	0621	0643	0664	0685	0707	0728
203	0750	0771	0792	0814	0835	0856	0878	0899	0920	0942
204	0963	0984	1006	1027	1048	1069	1091	1112	1133	1154
205	1175	1197	1218	1239	1260	1281	1302	1323	1345	1366
206	1387	1408	1429	1450	1471	1492	1513	1534	1555	1576
207	1597	1618	1639	1660	1681	1702	1723	1744	1765	1785
208	1806	1827	1848	1869	1890	1911	1931	1952	1973	1994
209	2015	2035	2056	2077	2098	2118	2139	2160	2181	2201
210	2222	2243	2263	2284	2305	2325	2346	2366	2387	2408
211	2428	2449	2469	2490	2510	2531	2552	2572	2593	2613
212	2634	2654	2675	2695	2715	2736	2756	2777	2797	2818
213	2838	2858	2879	2899	2919	2940	2960	2980	3001	3021
214	3041	3062	3082	3102	3122	3143	3163	3183	3203	3224
215	3244	3264	3284	3304	3325	3345	3365	3385	3405	3425
216	3445	3465	3486	3506	3526	3546	3566	3586	3606	3626
217	3646	3666	3686	3706	3726	3746	3766	3786	3806	3826
218	3846	3866	3885	3905	3925	3945	3965	3985	4005	4025
219	4044	4064	4084	4104	4124	4143	4163	4183	4203	4223
No.	0	1	2	3	4	5	6	7	8	9

No 2200 —— 2800. Log. 34242 —— 44716.

No.	0	1	2	3	4	5	6	7	8	9
220	34242	34262	34282	34301	34321	34341	34361	34380	34400	34420
221	4439	4459	4479	4498	4518	4537	4557	4577	4596	4616
222	4635	4655	4674	4694	4713	4733	4753	4772	4792	4811
223	4830	4850	4869	4889	4908	4928	4947	4967	4986	5005
224	5025	5044	5064	5083	5102	5122	5141	5160	5180	5199
225	5218	5238	5257	5276	5295	5315	5334	5353	5372	5392
226	5411	5430	5449	5468	5488	5507	5526	5545	5564	5583
227	5603	5622	5641	5660	5679	5698	5717	5736	5755	5774
228	5793	5813	5832	5851	5870	5889	5908	5927	5946	5965
229	5984	6003	6021	6040	6059	6078	6097	6116	6135	6154
230	6173	6192	6211	6229	6248	6267	6286	6305	6324	6342
231	6361	6380	6399	6418	6436	6455	6474	6493	6511	6530
232	6549	6568	6586	6605	6624	6642	6661	6680	6698	6717
233	6736	6754	6773	6791	6810	6829	6847	6866	6884	6903
234	6922	6940	6959	6977	6996	7014	7033	7051	7070	7088
235	7107	7125	7144	7162	7181	7199	7218	7236	7254	7273
236	7291	7310	7328	7346	7365	7333	7401	7420	7438	7457
237	7475	7493	7511	7530	7548	7566	7585	7603	7621	7639
238	7658	7676	7694	7712	7731	7749	7767	7785	7803	7822
239	7840	7858	7876	7894	7912	7931	7949	7967	7985	8003
240	8021	8039	8057	8075	8093	8112	8130	8148	8166	8184
241	8202	8220	8238	8256	8274	8292	8310	8328	8346	8364
242	8382	8399	8417	8435	8453	8471	8489	8507	8525	8543
243	8561	8578	8596	8614	8632	8650	8668	8686	8703	8721
244	8739	8757	8775	8792	8810	8828	8846	8863	8881	8899
245	8917	8934	8952	8970	8987	9005	9023	9041	9058	9076
246	9094	9111	9129	9146	9164	9182	9199	9217	9235	9252
247	9270	9287	9305	9322	9340	9358	9375	9393	9410	9428
248	9445	9463	9480	9498	9515	9533	9550	9568	9585	9602
249	9620	9637	9655	9672	9690	9707	9724	9742	9759	9777
250	9794	9811	9829	9846	9863	9881	9898	9915	9933	9950
251	9967	9985	40002	40019	40037	40054	40071	40088	40106	40123
252	40140	40157	0175	0192	0209	0226	0243	0261	0278	0295
253	0312	0329	0346	0364	0381	0398	0415	0432	0449	0466
254	0483	0500	0518	0535	0552	0569	0586	0603	0620	0637
255	0654	0671	0688	0705	0722	0739	0756	0773	0790	0807
256	0824	0841	0858	0875	0892	0909	0926	0943	0960	0976
157	0993	1010	1027	1044	1061	1078	1095	1111	1128	1145
258	1162	1179	1196	1212	1229	1246	1263	1280	1296	1313
259	1330	1347	1363	1380	1397	1414	1430	1447	1464	1481
260	1497	1514	1531	1547	1564	1581	1597	1614	1631	1647
261	1664	1681	1697	1714	1731	1747	1764	1780	1797	1814
262	1830	1847	1863	1880	1896	1913	1929	1946	1963	1979
263	1996	2012	2029	2045	2062	2078	2095	2111	2127	2144
264	2160	2177	2193	2210	2226	2243	2259	2275	2292	2308
265	2325	2341	2357	2375	2390	2406	2423	2439	2455	2472
266	2488	2504	2521	2537	2553	2570	2586	2602	2619	2635
267	2651	2667	2684	2700	2716	2732	2749	2765	2781	2797
268	2813	2830	2846	2862	2878	2894	2911	2927	2943	2959
269	2975	2991	3008	3024	3040	3056	3072	3088	3104	3120
270	3136	3152	3169	3185	3201	3217	3233	3249	3265	3281
271	3297	3313	3329	3345	3361	3377	3393	3409	3425	3441
272	3457	3473	3489	3505	3521	3537	3553	3569	3584	3600
273	3616	3632	3648	3664	3680	3696	3712	3727	3743	3759
274	3775	3791	3807	3823	3838	3854	3870	3886	3902	3917
275	3933	3949	3965	3981	3996	4012	4028	4044	4059	4075
276	4091	4107	4122	4138	4154	4170	4185	4201	4217	4232
277	4248	4264	4279	4295	4311	4326	4342	4358	4373	4389
278	4404	4420	4436	4451	4467	4483	4498	4514	4529	4545
279	4560	4576	4592	4607	4623	4638	4654	4669	4685	4700
No.	0	1	2	3	4	5	6	7	6	9

No 2800——3400 Log 44716——53148

No.	0	1	2	3	4	5	6	7	8	9
280	44716	44731	44747	44762	44778	44793	44809	44824	44840	44855
281	4871	4886	4902	4917	4932	4948	4963	4979	4994	5010
282	5025	5040	5056	5071	5086	5102	5117	5133	5148	5163
283	5179	5194	5209	5225	5240	5255	5271	5286	5301	5317
284	5332	5347	5362	5378	5393	5408	5423	5439	5454	5469
285	5484	5500	5515	5530	5545	5561	5576	5591	5606	5621
286	5637	5652	5667	5682	5697	5712	5728	5743	5758	5773
287	5788	5803	5818	5834	5849	5864	5879	5894	5909	5924
288	5939	5954	5969	5984	6000	6015	6030	6045	6060	6075
289	6090	6105	6120	6135	6150	6165	6180	6195	6210	6225
290	6240	6255	6270	6285	6300	6315	6330	6345	6359	6374
291	6389	6404	6419	6434	6449	6464	6479	6494	6509	6523
292	6538	6553	6568	6583	6598	6613	6627	6642	6657	6672
293	6687	6702	6716	6731	6746	6761	6776	6790	6805	6820
294	6835	6850	6864	6879	6894	6909	6923	6938	6953	6967
295	6982	6997	7012	7026	7041	7056	7070	7085	7100	7114
296	7129	7144	7159	7173	7188	7202	7217	7232	7246	7261
297	7276	7290	7305	7319	7334	7349	7363	7378	7392	7407
298	7422	7436	7451	7465	7480	7494	7509	7524	7538	7553
299	7567	7582	7596	7611	7625	7640	7654	7669	7683	7698
300	7712	7727	7741	7756	7770	7784	7799	7813	7828	7842
301	7857	7871	7885	7900	7914	7929	7943	7958	7972	7986
302	8001	8015	8029	8044	8058	8073	8087	8101	8116	8130
303	8144	8159	8173	8187	8202	8216	8230	8244	8259	8273
304	8287	8302	8316	8330	8344	8359	8373	8387	8401	8416
305	8430	8444	8458	8473	8487	8501	8515	8530	8544	8558
306	8572	8586	8601	8615	8629	8643	8657	8671	8686	8700
307	8714	8728	8742	8756	8770	8785	8799	8813	8827	8841
308	8855	8869	8883	8897	8911	8926	8940	8954	8968	8982
309	8996	9010	9024	9038	9052	9066	9080	9094	9108	9122
310	9136	9150	9164	9178	9192	9206	9220	9234	9248	9262
311	9276	9290	9304	9318	9332	9346	9360	9374	9388	9402
312	9415	9429	9443	9457	9471	9485	9499	9513	9527	9541
313	9554	9568	9582	9596	9610	9624	9638	9651	9665	9679
314	9693	9707	9721	9734	9748	9762	9776	9790	9803	9817
315	9831	9845	9859	9872	9886	9900	9914	9927	9941	9955
316	9969	9982	9996	50010	50024	50037	50051	50065	50079	50092
317	50106	50120	50133	0147	0161	0174	0188	0202	0215	0229
318	0243	0256	0270	0284	0297	0311	0325	0338	0352	0365
319	0379	0393	0406	0420	0433	0447	0461	0474	0488	0501
320	0515	0529	0542	0556	0569	0583	0596	0610	0623	0637
321	0651	0664	0678	0691	0705	0718	0732	0745	0759	0772
322	0786	0799	0813	0826	0840	0853	0866	0880	0893	0907
323	0920	0934	0947	0961	0974	0987	1001	1014	1028	1041
324	1055	1068	1081	1095	1108	1121	1135	1148	1162	1175
325	1188	1202	1215	1228	1242	1255	1268	1282	1295	1308
326	1322	1335	1348	1362	1375	1388	1402	1415	1428	1441
327	1455	1468	1481	1495	1508	1521	1534	1548	1561	1574
328	1587	1601	1614	1627	1640	1654	1667	1680	1693	1706
329	1720	1733	1746	1759	1772	1786	1799	1812	1825	1838
330	1851	1865	1878	1891	1904	1917	1930	1943	1957	1970
331	1983	1996	2009	2022	2035	2048	2061	2075	2088	2101
332	2114	2127	2140	2153	2166	2179	2192	2205	2218	2231
333	2244	2257	2270	2284	2297	2310	2323	2336	2349	2362
234	2375	2388	2401	2414	2427	2440	2453	2466	2479	2492
335	2504	2517	2530	2543	2556	2569	2582	2595	2608	2621
336	2634	2647	2660	2673	2686	2699	2711	2724	2737	2750
337	2763	2776	2789	2802	2815	2827	2840	2853	2866	2879
338	2892	2905	2917	2930	2943	2956	2969	2982	2994	3007
339	3020	3033	3046	3058	3071	3084	3097	3110	3122	3135
No.	0	1	2	3	4	5	6	7	8	9

No. 3400——4000. Log. 53148——60206.

No.	0	1	2	3	4	5	6	7	8	9
340	53148	53161	53173	53186	53199	53212	53224	53237	53250	53263
341	3275	3288	3301	3314	3326	3339	3352	3364	3377	3390
342	3403	3415	3428	3441	3453	3466	3479	3491	3504	3517
343	3529	3542	3555	3567	3580	3593	3605	3618	3631	3643
344	3656	3668	3681	3694	3706	3719	3732	3744	3757	3769
345	3782	3794	3807	3820	3832	3845	3857	3870	3882	3895
346	3908	3920	3933	3945	3958	3970	3983	3995	4008	4020
347	4033	4045	4058	4070	4083	4095	4108	4120	4133	4145
348	4158	4170	4183	4195	4208	4220	4233	4245	4258	4270
349	4283	4295	4307	4320	4332	4345	4357	4370	4382	4394
350	4407	4419	4432	4444	4456	4469	4481	4494	4506	4518
351	4531	4543	4555	4568	4580	4593	4605	4617	4630	4642
352	4654	4667	4679	4691	4704	4716	4728	4741	4753	4765
353	4777	4790	4802	4814	4827	4839	4851	4864	4876	4888
354	4900	4913	4925	4937	4949	4962	4974	4986	4998	5011
355	5023	5035	5047	5060	5072	5084	5096	5108	5121	5133
356	5145	5157	5169	5182	5194	5206	5218	5230	5242	5255
357	5267	5279	5291	5303	5315	5328	5340	5352	5364	5376
358	5388	5400	5413	5425	5437	5449	5461	5473	5485	5497
359	5509	5522	5534	5546	5558	5570	5582	5594	5606	5618
360	5630	5642	5654	5666	5678	5691	5703	5715	5727	5739
361	5751	5763	5775	5787	5799	5811	5823	5835	5847	5859
362	5871	5883	5895	5907	5919	5931	5943	5955	5967	5979
363	5991	6003	6015	6027	6038	6050	6062	6074	6086	6098
364	6110	6122	6134	6146	6158	6170	6182	6194	6205	6217
365	6229	6241	6253	6265	6277	6289	6301	6312	6324	6336
366	6348	6360	6372	6384	6396	6407	6419	6431	6443	6455
367	6467	6478	6490	6502	6514	6526	6538	6549	6561	6573
368	6585	6597	6608	6620	6632	6644	6656	6667	6679	6691
369	6703	6714	6726	6738	6750	6761	6773	6785	6797	6808
370	6820	6832	6844	6855	6867	6879	6391	6902	6914	6926
371	6937	6949	6961	6972	6984	6996	7008	7019	7031	7043
372	7054	7066	7078	7089	7101	7113	7124	7136	7148	7159
373	7171	7183	7194	7206	7217	7229	7241	7252	7264	7276
374	7287	7299	7310	7322	7334	7345	7357	7368	7380	7392
375	7403	7415	7426	7438	7449	7461	7473	7484	7496	7507
376	7519	7530	7542	7553	7565	7576	7588	7600	7611	7623
377	7634	7646	7657	7669	7680	7692	7703	7715	7726	7738
378	7749	7761	7772	7784	7795	7807	7818	7830	7841	7852
379	7864	7875	7887	7898	7910	7921	7933	7944	7955	7967
380	7978	7990	8001	8013	8024	8035	8047	8058	8070	8081
381	8092	8104	8115	8127	8138	8149	8161	8172	8184	8195
382	8206	8218	8229	8240	8252	8263	8274	8286	8297	8309
383	8320	8331	8343	8354	8365	8377	8388	8399	8410	8422
384	8433	8444	8456	8467	8478	8490	8501	8512	8524	8535
385	8546	8557	8569	8580	8591	8602	8614	8625	3636	8647
386	8659	8670	8681	8692	8704	8715	8726	8737	8749	8760
387	8771	8782	8794	8805	8816	8827	8838	8850	8861	8872
388	8883	8894	8906	8917	8928	8939	8950	8961	8973	8984
389	8995	9006	9017	9028	9040	9051	9062	9073	9084	9095
390	9106	9118	9129	9140	9151	9162	9173	9184	9195	9207
391	9218	9229	9240	9251	9262	9273	9284	9295	9306	9318
392	9329	9340	9351	9362	9373	9384	9395	9406	9417	9428
393	9439	9450	9461	9472	9483	9494	9506	9517	9528	9539
394	9550	9561	9572	9583	9594	9605	9616	9627	9638	9649
395	9660	9671	9682	9693	9704	9715	9726	9737	9748	9759
396	9770	9780	9791	9802	9813	9824	9835	9846	9857	9868
397	9879	9890	9901	9912	9923	9934	9945	9956	9966	9977
398	9988	9999	60010	60021	60032	60043	60054	60065	60076	60086
399	60097	60108	0119	0130	0141	0152	0163	0173	0184	0195
No.	0	1	2	3	4	5	6	7	8	9

No. 4000——4600. Log. 60206——66276.

No.	0	1	2	3	4	5	6	7	8	9
400	60206	60217	60228	60239	60249	60260	60271	60282	60293	60304
401	0314	0325	0336	0347	0358	0369	0379	0390	0401	0412
402	0423	0433	0444	0455	0466	0477	0487	0498	0509	0520
403	0531	0541	0552	0563	0574	0584	0595	0606	0617	0627
404	0638	0649	0660	0670	0681	0692	0703	0713	0724	0735
405	0746	0756	0767	0778	0788	0799	0810	0821	0831	0842
406	0853	0863	0874	0885	0895	0906	0917	0927	0938	0949
407	0959	0970	0981	0991	1002	1013	1023	1034	1045	1055
408	1066	1077	1087	1098	1109	1119	1130	1140	1151	1162
409	1172	1183	1194	1204	1215	1225	1236	1247	1257	1268
410	1278	1289	1300	1310	1321	1331	1342	1352	1363	1374
411	1384	1395	1405	1416	1426	1437	1448	1458	1469	1479
412	1490	1500	1511	1521	1532	1542	1553	1563	1574	1584
413	1595	1606	1616	1627	1637	1648	1658	1669	1679	1690
414	1700	1711	1721	1731	1742	1752	1763	1773	1784	1794
415	1805	1815	1826	1836	1847	1857	1868	1878	1888	1899
416	1909	1920	1930	1941	1951	1962	1972	1982	1993	2003
417	2014	2024	2034	2045	2055	2066	2076	2086	2097	2107
418	2118	2128	2138	2149	2159	2170	2180	2190	2201	2211
419	2221	2232	2242	2252	2263	2273	2284	2294	2304	2315
420	2325	2335	2346	2356	2366	2377	2387	2397	2408	2418
421	2428	2439	2449	2459	2469	2480	2490	2500	2511	2571
422	2531	2542	2552	2562	2572	2583	2593	2603	2613	2624
423	2634	2644	2655	2665	2675	2685	2696	2706	2716	2726
424	2737	2747	2757	2767	2778	2788	2798	2808	2818	2829
425	2839	2849	2859	2870	2880	2890	2900	2910	2921	2931
426	2941	2951	2961	2972	2982	2992	3002	3012	3022	3033
427	3043	3053	3063	3073	3083	3094	3104	3114	3124	3134
428	3144	3155	3165	3175	3185	3195	3205	3215	3225	3236
429	3246	3256	3266	3276	3286	3296	3306	3317	3327	3337
430	3347	3357	3367	3377	3387	3397	3407	3417	3428	3438
431	3448	3458	3468	3478	3488	3498	3508	3518	3528	3538
432	3548	3558	3568	3579	3589	3599	3609	3619	3629	3639
433	3649	3659	3669	3679	3689	3699	3709	3719	3729	3739
434	3749	3759	3769	3779	3789	3799	3809	3819	3829	3839
435	3849	3859	3869	3879	3889	3899	3909	3919	3929	3939
436	3949	3959	3969	3979	3988	3998	4008	4018	4028	4038
437	4048	4058	4068	4078	4088	4098	4108	4118	4128	4137
438	4147	4157	4167	4177	4187	4197	4207	4217	4227	4237
439	4246	4256	4266	4276	4286	4296	4306	4316	4326	4335
440	4345	4355	4365	4375	4385	4395	4404	4414	4424	4434
441	4444	4454	4464	4473	4483	4493	4503	4513	4523	4532
442	4542	4552	4562	4572	4582	4591	4601	4611	4621	4631
443	4640	4650	4660	4670	4680	4689	4699	4709	4719	4729
444	4738	4748	4758	4768	4777	4787	4797	4807	4816	4826
445	4836	4846	4856	4865	4875	4885	4895	4904	4914	4924
446	4933	4943	4953	4963	4972	4982	4992	5002	5011	5021
447	5031	5040	5050	5060	5070	5079	5089	5099	5108	5118
448	5128	5137	5147	5157	5167	5176	5186	5196	5205	5215
449	5225	5234	5244	5254	5263	5273	5283	5292	5302	5312
450	5321	5331	5341	5350	5360	5369	5379	5389	5398	5408
451	5418	5427	5437	5447	5456	5466	5475	5485	5495	5504
452	5514	5523	5533	5543	5552	5562	5571	5581	5591	5600
453	5610	5619	5629	5639	5648	5658	5667	5677	5686	5696
454	5706	5715	5725	5734	5744	5753	5763	5772	5782	5792
455	5801	5811	5820	5830	5839	5849	5858	5868	5877	5887
456	5896	5906	5916	5925	5935	5944	5954	5963	5973	5982
457	5992	6001	6011	6020	6030	6039	6049	6058	6068	6077
458	6087	6096	6106	6115	6124	6134	6143	6153	6162	6172
459	6181	6191	6200	6210	6219	6229	6238	6247	6257	6266
No.	0	1	2	3	4	5	6	7	8	9

No. 4600——5100. Log. 66276——71600.

No.	0	1	2	3	4	5	6	7	8	9
460	66276	66285	66295	66304	66314	66323	66332	66342	66351	66361
461	6370	6380	6389	6398	6408	6417	6427	6436	6445	6455
462	6464	6474	6483	6492	6502	6511	6521	6530	6539	6549
463	6558	6567	6577	6586	6596	6605	6614	6624	6633	6642
464	6652	6661	6671	6680	6689	6699	6708	6717	6727	6736
465	6745	6755	6764	6773	6783	6792	6801	6811	6820	6829
466	6839	6848	6857	6867	6876	6885	6894	6904	6913	6922
467	6932	6941	6950	6960	6969	6978	6987	6997	7006	7015
468	7025	7034	7043	7052	7062	7071	7080	7089	7099	7108
469	7117	7127	7136	7145	7154	7164	7173	7182	7191	7201
470	7210	7219	7228	7237	7247	7256	7265	7274	7284	7293
471	7302	7311	7321	7330	7339	7348	7357	7367	7376	7385
472	7394	7403	7413	7422	7431	7440	7449	7459	7468	7477
473	7486	7495	7504	7514	7523	7532	7541	7550	7560	7569
474	7578	7587	7596	7605	7614	7624	7633	7642	7651	7660
475	7669	7679	7688	7697	7706	7715	7724	7733	7742	7752
476	7761	7770	7779	7788	7797	7806	7815	7825	7834	7843
477	7852	7861	7870	7879	7888	7897	7906	7916	7925	7934
478	7943	7952	7961	7970	7979	7988	7997	8006	8015	8024
479	8034	8043	8052	8061	8070	8079	8088	8097	8106	8115
480	8124	8133	8142	8151	8160	8169	8178	8187	8196	8205
481	8215	8224	8233	8242	8251	8260	8269	8278	8287	8296
482	8305	8314	8323	8332	8341	8350	8359	8368	8377	8386
483	8395	8404	8413	8422	8431	8440	8449	8458	8467	8476
484	8485	8494	8502	8511	8520	8529	8538	8547	8556	8565
485	8574	8583	8592	8601	8610	8619	8628	8637	8646	8655
486	8664	8673	8681	8690	8699	8708	8717	8726	8735	8744
487	8753	8762	8771	8780	8789	8797	8806	8815	8824	8833
488	8842	8851	8860	8869	8878	8886	8895	8904	8913	8922
489	8931	8940	8949	8958	8966	8975	8984	8993	9002	9011
490	9020	9028	9037	9046	9055	9064	9073	9082	9090	9099
491	9108	9117	9126	9135	9144	9152	9161	9170	9179	9188
492	9197	9205	9214	9223	9232	9241	9249	9258	9267	9276
493	9285	9294	9302	9311	9320	9329	9338	9346	9355	9364
494	9373	9381	9390	9399	9408	9417	9425	9434	9443	9452
495	9461	9469	9478	9487	9496	9504	9513	9522	9531	9539
496	9548	9557	9566	9574	9583	9592	9601	9609	9618	9627
497	9636	9644	9653	9662	9671	9679	9688	9697	9705	9714
498	9723	9732	9740	9749	9758	9767	9775	9784	9793	9801
499	9810	9819	9827	9836	9845	9854	9862	9871	9880	9888
500	9897	9906	9914	9923	9932	9940	9949	9958	9966	9975
501	9984	9992	70001	70010	70018	70027	70036	70044	70053	70062
502	70070	70079	0088	0096	0105	0114	0122	0131	0140	0148
503	0157	0165	0174	0183	0191	0200	0209	0217	0226	0234
504	0243	0252	0260	0269	0278	0286	0295	0303	0312	0321
505	0329	0338	0346	0355	0364	0372	0381	0389	0398	0406
506	0415	0424	0432	0441	0449	0458	0467	0475	0484	0492
507	0501	0509	0518	0526	0535	0544	0552	0561	0569	0578
508	0586	0595	0603	0612	0621	0629	0638	0646	0655	0663
509	0672	0680	0689	0697	0706	0714	0723	0731	0740	0749
510	0757	0766	0774	0783	0791	0800	0808	0817	0825	0834
511	0842	0851	0859	0868	0876	0885	0893	0902	0910	0919
512	0927	0935	0944	0952	0961	0969	0978	0986	0995	1003
513	1012	1020	1029	1037	1046	1054	1063	1071	1079	1088
514	1096	1105	1113	1122	1130	1139	1147	1155	1164	1172
515	1181	1189	1198	1206	1214	1223	1231	1240	1248	1257
516	1265	1273	1282	1290	1299	1307	1315	1324	1332	1341
517	1349	1357	1366	1374	1383	1391	1399	1408	1416	1425
518	1433	1441	1450	1458	1466	1475	1483	1492	1500	1509
519	1517	1525	1533	1542	1550	1559	1567	1575	1584	1592
No.	0	1	2	3	4	5	6	7	8	9

No. 5200——5800. Log. 71600——76343.

No.	0	1	2	3	4	5	6	7	8	9
520	71600	71609	71617	71625	71634	71642	71650	71659	71667	71675
521	1684	1692	1700	1709	1717	1725	1734	1742	1750	1759
522	1767	1775	1784	1792	1800	1809	1817	1825	1834	1842
523	1850	1858	1867	1875	1883	1892	1900	1908	1917	1925
524	1933	1941	1950	1958	1966	1975	1983	1991	1999	2008
525	2016	2024	2032	2041	2049	2057	2066	2074	2082	2090
526	2099	2107	2115	2123	2132	2140	2148	2156	2165	2173
527	2181	2189	2198	2206	2214	2222	2230	2239	2247	2255
528	2263	2272	2280	2288	2296	2304	2313	2321	2329	2337
529	2346	2354	2362	2370	2378	2387	2395	2403	2411	2419
530	2428	2436	2444	2452	2460	2469	2477	2485	2493	2501
531	2509	2518	2526	2534	2542	2550	2558	2567	2575	2583
532	2591	2599	2607	2616	2624	2632	2640	2648	2656	2665
533	2673	2681	2689	2697	2705	2713	2722	2730	2738	2746
534	2754	2762	2770	2779	2787	2795	2803	2811	2819	2827
535	2835	2843	2852	2860	2868	2876	2884	2892	2900	2908
536	2916	2925	2933	2941	2949	2957	2965	2973	2981	2989
537	2997	3006	3014	3022	3030	3038	3046	3054	3062	3070
538	3078	3086	3094	3102	3111	3119	3127	3135	3143	3151
539	3159	3167	3175	3183	3191	3199	3207	3215	3223	3231
540	3239	3247	3255	3263	3272	3280	3288	3296	3304	3312
541	3320	3328	3336	3344	3352	3360	3368	3376	3384	3392
542	3400	3408	3416	3424	3432	3440	3448	3456	3464	3472
543	3480	3488	3496	3504	3512	3520	3528	3536	3544	3552
544	3560	3568	3576	3584	3592	3600	3608	3616	3624	3632
545	3640	3648	3656	3664	3672	3679	3687	3695	3703	3711
546	3719	3727	3735	3743	3751	3759	3767	3775	3783	3791
547	3799	3807	3815	3823	3830	3838	3846	3854	3862	3870
548	3878	3886	3894	3902	3910	3918	3926	3933	3941	3949
549	3957	3965	3973	3981	3989	3997	4005	4013	4020	4028
550	4036	4044	4052	4060	4068	4076	4084	4092	4099	4107
551	4115	4123	4131	4139	4147	4155	4162	4170	4178	4186
552	4194	4202	4210	4218	4225	4233	4241	4249	4257	4265
553	4273	4280	4288	4296	4304	4312	4320	4327	4335	4343
554	4351	4359	4367	4374	4382	4390	4398	4406	4414	4421
555	4429	4437	4445	4453	4461	4468	4476	4484	4492	4500
556	4507	4515	4523	4531	4539	4547	4554	4562	4570	4578
557	4586	4593	4601	4609	4617	4624	4632	4640	4648	4656
558	4663	4671	4679	4687	4695	4702	4710	4718	4726	4733
559	4741	4749	4757	4764	4772	4780	4788	4796	4803	4811
560	4819	4827	4834	4842	4850	4858	4865	4873	4881	4889
561	4896	4904	4912	4920	4927	4935	4943	4950	4958	4966
562	4974	4981	4989	4997	5005	5012	5020	5028	5035	5043
563	5051	5059	5066	5074	5082	5089	5097	5105	5113	5120
564	5128	5136	5143	5151	5159	5166	5174	5182	5189	5197
565	5205	5213	5220	5228	5236	5243	5251	5259	5266	5274
566	5282	5289	5297	5305	5312	5320	5328	5335	5343	5351
567	5358	5366	5374	5381	5389	5397	5404	5412	5420	5427
568	5435	5442	5450	5458	5465	5473	5481	5488	5496	5504
569	5511	5519	5526	5534	5542	5549	5557	5565	5572	5580
570	5587	5595	5603	5610	5618	5626	5633	5641	5648	5656
571	5664	5671	5679	5686	5694	5702	5709	5717	5724	5732
572	5740	5747	5755	5762	5770	5778	5785	5793	5800	5808
573	5815	5823	5831	5838	5846	5853	5861	5868	5876	5884
574	5891	5899	5906	5914	5921	5929	5937	5944	5952	5959
575	5967	5974	5982	5989	5997	6005	6012	6020	6027	6035
576	6042	6050	6057	6065	6072	6080	6087	6095	6103	6110
577	6118	6125	6133	6140	6148	6155	6163	6170	6178	6185
578	6193	6200	6208	6215	6223	6230	6238	6245	6253	6260
579	6268	6275	6283	6290	6298	6305	6313	6320	6328	6335
No.	0	1	2	3	4	5	6	7	8	9

No. 5800——6400. Log. 76343——80618.

No	0	1		3	4	5	6	7	8	9
580	76343	76350	76358	76365	76373	76380	76388	76395	76403	76410
581	6418	6425	6433	6440	6448	6455	6462	6470	6477	6485
582	6492	6500	6507	6515	6522	6530	6537	6545	6552	6559
583	6567	6574	6582	6589	6597	6604	6612	6619	6626	6634
584	6641	6649	6656	6664	6671	6678	6686	6693	6701	6708
585	6716	6723	6730	6738	6745	6753	6760	6768	6775	6782
586	6790	6797	6805	6812	6819	6827	6834	6842	6849	6856
587	6864	6871	6879	6836	6893	6901	6903	6916	6923	6930
588	6938	6945	6953	6960	6967	6975	6932	6989	6997	7004
589	7012	7019	7026	7034	7041	7048	7056	7063	7070	7078
590	7085	7093	7100	7107	7115	7122	7129	7137	7144	7151
591	7159	7166	7173	7181	7188	7195	7203	7210	7217	7225
592	7232	7240	7247	7254	7262	7269	7276	7283	7291	7298
593	7305	7313	7320	7327	7335	7342	7349	7357	7364	7371
594	7379	7386	7393	7401	7408	7415	7422	7430	7437	7444
595	7452	7459	7466	7474	7481	7488	7495	7503	7510	7517
596	7525	7532	7539	7546	7554	7561	7568	7576	7583	7590
597	7597	7605	7612	7619	7627	7634	7641	7648	7656	7663
598	7670	7677	7685	7692	7699	7706	7714	7721	7723	7735
599	7743	7750	7757	7764	7772	7779	7786	7793	7801	7808
600	7815	7822	7830	7837	7944	7851	7859	7866	7873	7880
601	7887	7895	7902	7909	7916	7924	7931	7938	7945	7952
602	7960	7967	7974	7981	7988	7996	8003	8010	8017	8025
603	8032	8039	8046	8053	8061	8068	8075	8082	8089	8097
604	8104	8111	8118	8125	8132	8140	8147	8154	8161	8168
605	8176	8183	8190	8197	8204	8211	8219	8226	8233	8240
606	8247	8254	8262	8269	8276	8283	8290	8297	8305	8312
607	8319	8326	8333	8340	8347	8355	8362	8369	8376	8383
608	8390	8398	8405	8412	8419	8426	8433	8440	8447	8455
609	8462	8469	8476	8483	8490	8497	8504	8512	8519	8526
610	8533	8540	8547	8554	8561	8569	8576	8583	8590	8597
611	8604	8611	8618	8625	8633	8640	8647	8654	8661	8668
612	8675	8682	8689	8696	8704	8711	8718	8725	8732	8739
613	8746	8753	8760	8767	8774	8781	8789	8796	8803	8810
614	8817	8824	8831	8838	8845	8852	8859	8866	8873	8880
615	8888	8895	8902	8909	8916	8923	8930	8937	8944	8951
616	8958	8965	8972	8979	8986	8993	9000	9007	9014	9021
617	9029	9036	9043	9050	9057	9064	9071	9078	9085	9092
618	9099	9106	9113	9120	9127	9134	9141	9148	9155	9162
619	9169	9176	9183	9190	9197	9204	9211	9218	9225	9232
620	9239	9246	9253	9260	9267	9274	9281	9288	9295	9302
621	9309	9316	9323	9330	9337	9344	9351	9358	9365	9372
622	9379	9386	9393	9400	9407	9414	9421	9428	9435	9442
623	9449	9456	9463	9470	9477	9484	9491	9498	9505	9511
624	9518	9525	9532	9539	9546	9553	9560	9567	9574	9581
625	9588	9595	9602	9609	9616	9623	9630	9637	9644	9650
626	9657	9664	9671	9678	9685	9692	9699	9706	9713	9720
627	9727	9734	9741	9748	9754	9761	9768	9775	9782	9789
628	9796	9803	9810	9817	9824	9831	9837	9844	9851	9858
629	9865	9872	9879	9886	9893	9900	9906	9913	9920	9927
630	9934	9941	9948	9955	9962	9969	9975	9982	9989	9996
631	80003	80010	80017	80024	80030	80037	80044	80051	80058	80065
632	0072	0079	0085	0092	0099	0106	0113	0120	0127	0134
633	0140	0147	0154	0161	0168	0175	0182	0188	0195	0202
634	0209	0216	0223	0229	0236	0243	0250	0257	0264	0271
635	0277	0284	0291	0298	0305	0312	0318	0825	0332	0339
636	0346	0353	0359	0366	0373	0380	0387	0393	0400	0407
637	0414	0421	0428	0434	0441	0448	0455	0462	0468	0475
638	0482	0489	0496	0502	0509	0516	0523	0530	0536	0543
639	0550	0557	0564	0570	0577	0584	0591	0598	0604	0611
No.	0	1	2	3	4	5	6	7	8	9

No. 6400——7000. Log. 80618——84510.

No.	0	1	2	3	4	5	6	7	8	9
640	80618	80625	80632	80638	80645	80652	80659	80665	80672	80679
641	0686	0693	0699	0706	0713	0720	0726	0733	0740	0747
642	0754	0760	0767	0774	0781	0787	0794	0801	0808	0814
643	0821	9828	0835	0841	0848	0855	0862	0869	0875	0882
644	0889	0895	0902	0909	0916	0922	0929	0936	0943	0949
645	0956	0963	0969	0976	0983	0990	0996	1003	1010	1017
646	1023	1030	1037	1043	1050	1057	1064	1070	1077	1084
647	1090	1097	1104	1111	1117	1124	1131	1137	1144	1151
648	1158	1164	1171	1178	1184	1191	1198	1204	1211	1218
649	1224	1231	1238	1245	1251	1258	1265	1271	1278	1285
650	1291	1298	1305	1311	1318	1325	1331	1338	1345	1351
651	1358	1365	1371	1378	1385	1391	1398	1405	1411	1418
652	1425	1431	1438	1445	1451	1458	1465	1471	1478	1485
653	1491	1498	1505	1511	1518	1525	1531	1538	1544	1551
654	1558	1564	1571	1578	1584	1591	1598	1604	1611	1617
655	1624	1631	1637	1644	1651	1657	1664	1671	1677	1684
656	1690	1697	1704	1710	1717	1723	1730	1737	1743	1750
657	1757	1763	1770	1776	1783	1790	1796	1803	1809	1816
658	1823	1829	1836	1842	1849	1856	1862	1869	1875	1882
659	1889	1895	1902	1908	1915	1921	1928	1935	1941	1948
660	1954	1961	1968	1974	1981	1987	1994	2000	2007	2014
661	2020	2027	2033	2040	2046	2053	2060	2066	2073	2079
662	2086	2092	2099	2105	2112	2119	2125	2132	2138	2145
663	2151	2158	2164	2171	2178	2184	2191	2197	2204	2210
664	2217	2223	2230	2236	2243	2249	2256	2263	2269	2276
665	2282	2289	2295	2302	2308	2315	2321	2328	2334	2341
666	2347	2354	2360	2367	2373	2380	2387	2393	2400	2406
667	2413	2419	2426	2432	2439	2445	2452	2458	2465	2471
668	2478	2484	2491	2497	2504	2510	2517	2523	2530	2536
669	2543	2549	2556	2562	2569	2575	2582	2588	2595	2601
670	2607	2614	2620	2627	2633	2640	2646	2653	2659	2666
671	2672	2679	2685	2692	2698	2705	2711	2718	2724	2730
672	2737	2743	2750	2756	2763	2769	2776	2782	2789	2795
673	2802	2808	2814	2821	2827	2834	2840	2847	2853	2860
674	2866	2872	2879	2885	2892	2898	2905	2911	2918	2924
675	2930	2937	2943	2950	2956	2963	2969	2975	2982	2988
676	2995	3001	3008	3014	3020	3027	3033	3040	3046	3052
677	3059	3065	3072	3078	3085	3091	3097	3104	3110	3117
678	3123	3129	3136	3142	3149	3155	3161	3168	3174	3181
679	3187	3193	3200	3206	3213	3219	3225	3232	3238	3245
680	3251	3257	3264	3270	3276	3283	3289	3296	3302	3308
681	3315	3321	3327	3334	3340	3347	3353	3359	3366	3372
682	3378	3385	3391	3398	3404	3410	3417	3423	3429	3436
683	3442	3448	3455	3461	3467	3474	3480	3487	3493	3499
684	3506	3512	3518	3525	3531	3537	3544	3550	3556	3563
685	3569	3575	3582	3588	3594	3601	3607	3613	3620	3626
686	3632	3639	3645	3651	3658	3664	3670	3677	3683	3689
687	3696	3702	3708	3715	3721	3727	3734	3740	3746	3753
688	3759	3765	3771	3778	3784	3790	3797	3803	3809	3816
689	3822	3828	3835	3841	3847	3853	3860	3866	3872	3879
690	3885.	3891	3897	3904	3910	3916	3923	3929	3935	3942
691	3948	3954	3960	3967	3973	3979	3985	3992	3998	4004
692	4011	4017	4023	4029	4036	4042	4048	4055	4061	4067
693	4073	4080	4086	4092	4098	4105	4111	4117	4123	4130
694	4136	4142	4148	4155	4161	4167	4173	4180	4186	4192
695	4198	4205	4211	4217	4223	4230	4236	4242	4248	4255
696	4261	4267	4273	4280	4286	4292	4298	4305	4311	4317
697	4323	4330	4336	4342	4348	4354	4361	4367	4373	4379
698	4386	4392	4398	4404	4410	4417	4423	4429	4435	4442
699	4448	4454	4460	4466	4473	4479	4485	4491	4497	4504
No.	0	1	2	3	4	5	6	7	8	9

No. 7000 — 7600. Log. 84510—8808

No.	0	1	2	3	4	5	6	7	8	9
700	84510	84516	84522	84528	84535	84541	84547	84553	84559	84566
701	4572	4578	4584	4590	4597	4603	4609	4615	4621	4628
702	4634	4640	4646	4652	4658	4665	4671	4677	4683	4689
703	4696	4702	4708	4714	4720	4726	4733	4739	4745	4751
704	4757	4763	4770	4776	4782	4788	4794	4800	4807	4813
705	4819	4825	4831	4837	4844	4850	4856	4862	4868	4874
706	4880	4887	4893	4899	4905	4911	4917	4924	4930	4936
707	4942	4948	4954	4960	4967	4973	4979	4985	4991	4997
708	5003	5009	5016	5022	5028	5034	5040	5046	5052	5058
709	5065	5071	5077	5083	5089	5095	5101	5107	5114	5120
710	5126	5132	5138	5144	5150	5156	5163	5169	5175	5181
711	5187	5193	5199	5205	5211	5217	5224	5230	5236	5242
712	5248	5254	5260	5266	5272	5278	5285	5291	5297	5303
713	5309	5315	5321	5327	5333	5339	5345	5352	5358	5364
714	5370	5376	5382	5388	5394	5400	5406	5412	5418	5425
715	5431	5437	5443	5449	5455	5461	5467	5473	5479	5485
716	5491	5497	5503	5509	5516	5522	5528	5534	5540	5546
717	5552	5558	5564	5570	5576	5582	5588	5594	5600	5606
718	5612	5618	5625	5631	5637	5643	5649	5655	5661	5667
719	5673	5679	5685	5691	5697	5703	5709	5715	5721	5727
720	5733	5739	5745	5751	5757	5763	5769	5775	5781	5788
721	5794	5800	5806	5812	5818	5824	5830	5836	5842	5848
722	5854	5860	5866	5872	5878	5884	5890	5896	5902	5908
723	5914	5920	5926	5932	5938	5944	5950	5956	5962	5968
724	5974	5980	5986	5992	5998	6004	6010	6016	6022	6028
725	6034	6040	6046	6052	6058	6064	6070	6076	6082	6088
726	6094	6100	6106	6112	6118	6124	6130	6136	6141	6147
727	6153	6159	6165	6171	6177	6183	6189	6195	6201	6207
728	6213	6219	6225	6231	6237	6243	6249	6255	6261	6267
729	6273	6279	6285	6291	6297	6303	6308	6314	6320	6326
730	6332	6338	6344	6350	6356	6362	6368	6374	6380	6386
731	6392	6398	6404	6410	6415	6421	6427	6433	6439	6445
732	6451	6457	6463	6469	6475	6481	6487	6493	6499	6504
733	6510	6516	6522	6528	6534	6540	6546	6552	6558	6564
734	6570	6576	6581	6587	6593	6599	6605	6611	6617	6623
735	6629	6635	6641	6646	6652	6658	6664	6670	6676	6682
736	6688	6694	6700	6705	6711	6717	6723	6729	6735	6741
737	6747	6753	6759	6764	6770	6776	6782	6788	6794	6800
738	6806	6812	6817	6823	6829	6835	6841	6847	6853	6859
739	6864	6870	6876	6882	6888	6894	6900	6906	6911	6917
740	6923	6929	6935	6941	6947	6953	6958	6964	6970	6976
741	6982	6988	6994	6999	7005	7011	7017	7023	7029	7035
742	7040	7046	7052	7058	7064	7070	7075	7081	7087	7093
743	7099	7105	7111	7116	7122	7128	7134	7140	7146	7151
744	7157	7163	7169	7175	7181	7186	7192	7198	7204	7210
745	7216	7221	7227	7233	7239	7245	7251	7256	7262	7268
746	7274	7280	7286	7291	7297	7303	7309	7315	7320	7326
747	7332	7338	7344	7349	7355	7361	7367	7373	7379	7384
748	7390	7396	7402	7408	7413	7419	7425	7431	7437	7442
749	7448	7454	7460	7466	7471	7477	7483	7489	7495	7500
750	7506	7512	7518	7523	7529	7535	7541	7547	7552	7558
751	7564	7570	7576	7581	7587	7593	7599	7604	7610	7616
752	7622	7628	7633	7639	7645	7651	7656	7662	7668	7674
753	7679	7685	7691	7697	7703	7708	7714	7720	7726	7731
754	7737	7743	7749	7754	7760	7766	7772	7777	7783	7789
755	7795	7800	7806	7812	7818	7823	7829	7835	7841	7846
756	7852	7858	7864	7869	7875	7881	7887	7892	7898	7904
757	7910	7915	7921	7927	7933	7938	7944	7950	7955	7961
758	7967	7973	7978	7984	7990	7996	8001	8007	8013	8018
759	8024	8030	8036	8041	8047	8053	8058	8064	8070	8076
No.	0	1	2	3	4	5	6	7	8	9

No 7600——8000 Log 88081——91381

No.	0	1	2	3	4	5	6	7	8	9
760	88081	88087	88093	88098	88104	88110	88160	88121	88127	88133
761	8138	8144	8150	8156	8161	8167	8173	8178	8184	8190
762	8195	8201	8207	8213	8218	8224	8230	8235	8241	8247
763	8252	8258	8264	8270	8275	8281	8287	8292	8298	8304
764	8309	8315	8321	8326	8332	8338	8343	8349	8355	8360
765	8366	8372	8377	8383	8389	8395	8400	8406	8412	8417
766	8423	8429	8434	8440	8446	8451	8457	8463	8468	8474
767	8480	8485	8491	8497	8502	8508	8513	8519	8525	8530
768	8536	8542	8547	8553	8559	8564	8570	8576	8581	8587
769	8593	8598	8604	8610	8615	8621	8627	8632	8638	8643
770	8649	8655	8660	8666	8672	8677	8683	8689	8694	8700
771	8705	8711	8717	8722	8728	8734	8739	8745	8750	8756
772	8762	8767	8773	8779	8784	8790	8795	8801	8807	8812
773	8818	8824	8829	8835	8840	8846	8852	8857	8863	8868
774	8874	8880	8885	8891	8897	8902	8908	8913	8919	8925
775	8930	8936	8941	8947	8953	8958	8964	8969	8975	8981
776	8986	8992	8997	9003	9009	9014	9020	9025	9031	9037
777	9042	9048	9053	9059	9064	9070	9076	081	087	092
778	9098	9104	9109	9115	9120	9126	9131	137	143	148
779	9154	9159	9165	9170	9176	9182	9187	193	198	204
780	9209	9215	9221	9226	9232	9237	9243	248	254	260
781	9265	9271	9276	9282	9287	9293	9298	304	310	315
782	9321	9326	9332	9337	9343	9348	9354	360	365	371
783	9376	9382	9387	9393	9398	9404	9409	415	421	426
784	9432	9437	9443	9448	9454	9459	9465	470	476	481
785	9487	9492	9498	9504	9509	9515	9520	526	531	537
786	9542	9548	9553	9559	9564	9570	9575	581	586	592
787	9597	9603	9609	9614	9620	9625	9631	636	642	647
788	9653	9658	9664	9669	9675	9680	9686	691	697	702
789	9708	9713	9719	9724	9730	9735	9741	746	752	757
790	9763	9768	9774	9779	9785	9790	9796	801	807	812
791	9818	9823	9829	9834	9840	9845	9851	856	862	867
792	9873	9878	9883	9889	9894	9900	9905	911	916	922
793	9927	9933	9938	9944	9949	9955	9960	966	971	977
794	9982	9988	9993	9998	90004	90009	90015	90020	90026	90031
795	90037	90042	90048	90053	0059	0064	0069	0075	0080	0086
796	0091	0097	0102	0108	0113	0119	0124	0129	0135	0140
797	0146	0151	0157	0162	0168	0173	0179	0184	0189	0195
798	0200	0206	0211	0217	0222	0227	0233	0238	0244	0249
799	0255	0260	0266	0271	0276	0282	0287	0293	0298	0304
800	0309	0314	0320	0325	0331	0336	0342	0347	0352	0358
801	0363	0369	0374	0380	0385	0390	0396	0401	0407	0412
802	0417	0423	0428	0434	0439	0445	0450	0455	0461	0466
803	0472	0477	0482	0488	0493	0499	0504	0509	0515	0520
804	0526	0531	0536	0542	0547	0553	0558	0563	0569	0574
805	0580	0585	0590	0596	0601	0607	0612	0617	0623	0628
806	0634	0639	0644	0650	0655	0660	0666	0671	0677	0682
807	0687	0693	0698	0703	0709	0714	0720	0725	0730	0736
808	0741	0747	0752	0757	0763	0768	0773	0779	0784	0789
809	0795	0800	0806	0811	0816	0822	0827	0832	0838	0843
810	0849	0854	0859	0865	0870	0875	0881	0886	0891	0897
811	0902	0907	0913	0918	0924	0929	0934	0940	0945	0950
812	0956	0961	0966	0972	0977	0982	0988	0993	0998	1004
813	1009	1014	1020	1025	1030	1036	1041	1046	1052	1057
814	1062	1068	1073	1078	1034	1089	1094	1100	1105	1110
815	1116	1121	1126	1132	1137	1142	1148	1153	1158	1164
816	1169	1174	1180	1185	1190	1196	1201	1206	1212	1217
817	1222	1228	1233	1238	1243	1249	1254	1259	1265	1270
818	1275	1281	1286	1291	1297	1302	1307	1312	1318	1323
819	1328	1334	1339	1344	1350	1355	1360	1365	1371	1376
No.	0	1	2	3	4	5	6	7	8	9

No. 8200——8800. Log. 91381——94443.

No.	0	1	2	3	4	5	6	7	8	9
820	91381	91387	91392	91397	91403	91408	91413	91418	91424	91429
821	1434	1440	1445	1450	1455	1461	1466	1471	1477	1482
822	1487	1492	1498	1503	1508	1514	1519	1524	1529	1535
823	1540	1545	1551	1556	1561	1566	1572	1577	1582	1587
824	1593	1598	1603	1609	1614	1619	1624	1630	1635	1640
825	1645	1651	1656	1661	1666	1672	1677	1682	1687	1693
826	1698	1703	1709	1714	1719	1724	1730	1735	1740	1745
827	1751	1756	1761	1766	1772	1777	1782	1787	1793	1798
828	1803	1808	1814	1819	1824	1829	1834	1840	1845	1850
829	1855	1861	1866	1871	1876	1882	1887	1892	1897	1903
830	1908	1913	1918	1924	1929	1934	1939	1944	1950	1955
831	1960	1965	1971	1976	1981	1986	1991	1997	2002	2007
832	2012	2018	2023	2028	2033	2038	2044	2049	2054	2059
833	2065	2070	2075	2080	2085	2091	2096	2101	2106	2111
834	2117	2122	2127	2132	2137	2143	2148	2153	2158	2163
835	2169	2174	2179	2184	2189	2195	2200	2205	2210	2215
836	2221	2226	2231	2236	2241	2247	2252	2257	2262	2267
837	2273	2278	2283	2288	2293	2298	2304	2309	2314	2319
838	2324	2330	2335	2340	2345	2350	2355	2361	2366	2371
839	2376	2381	2387	2392	2397	2402	2407	2412	2418	2423
840	2428	2433	2438	2443	2449	2454	2459	2464	2469	2474
841	2480	2485	2490	2495	2500	2505	2511	2516	2521	2526
842	2531	2536	2542	2547	2552	2557	2562	2567	2572	2578
843	2583	2588	2593	2598	2603	2609	2614	2619	2624	2629
844	2634	2639	2645	2650	2655	2660	2665	2670	2675	2681
845	2686	2691	2696	2701	2706	2711	2716	2722	2727	2732
846	2737	2742	2747	2752	2758	2763	2768	2773	2778	2783
847	2788	2793	2799	2804	2809	2814	2819	2824	2829	2834
848	2840	2845	2850	2855	2860	2865	2870	2875	2881	2886
849	2891	2896	2901	2906	2911	2916	2921	2927	2932	2937
850	2942	2947	2952	2957	2962	2967	2973	2978	2983	2988
851	2993	2998	3003	3008	3013	3018	3024	3029	3034	3039
852	3044	3049	3054	3059	3064	3069	3075	3080	3085	3090
853	3095	3100	3105	3110	3115	3120	3125	3131	3136	3141
854	3146	3151	3156	3161	3166	3171	3176	3181	3186	3192
855	3197	3202	3207	3212	3217	3222	3227	3232	3237	3242
856	3247	3252	3258	3263	3268	3273	3278	3283	3288	3293
857	3298	3303	3308	3313	3318	3323	3328	3334	3339	3344
858	3349	3354	3359	3364	3369	3374	3379	3384	3389	3394
859	3399	3404	3409	3414	3420	3425	3430	3435	3440	3445
860	3450	3455	3460	3465	3470	3475	3480	3485	3490	3495
861	3500	3505	3510	3515	3520	3526	3531	3536	3541	3546
862	3551	3556	3561	3566	3571	3576	3581	3586	3591	3596
863	3601	3606	3611	3616	3621	3626	3631	3636	3641	3646
864	3651	3656	3661	3666	3671	3676	3682	3687	3692	3697
865	3702	3707	3712	3717	3722	3727	3732	3737	3742	3747
866	3752	3757	3762	3767	3772	3777	3782	3787	3792	3797
867	3802	3807	3812	3817	3822	3827	3832	3837	3842	3847
868	3852	3857	3862	3867	3872	3877	3882	3887	3892	3897
869	3902	3907	3912	3917	3922	3927	3932	3937	3942	3947
870	3952	3957	3962	3967	3972	3977	3982	3987	3992	3997
871	4002	4007	4012	4017	4022	4027	4032	4037	4042	4047
872	4052	4057	4062	4067	4072	4077	4082	4086	4091	4096
873	4101	4106	4111	4116	4121	4126	4131	4136	4141	4146
874	4151	4156	4161	4166	4171	4176	4181	4186	4191	4196
875	4201	4206	4211	4216	4221	4226	4231	4236	4240	4245
876	4250	4255	4260	4265	4270	4275	4280	4285	4290	4295
877	4300	4305	4310	4315	4320	4325	4330	4335	4340	4345
878	4349	4354	4359	4364	4369	4374	4379	4384	4389	4394
879	4399	4404	4409	4414	4419	4424	4429	4433	4438	4443
No.	0	1	2	3	4	5	6	7	8	9

No. 8800——9400. Log. 94448——97313.

No.	0	1	2	3	4	5	6	7	8	9
880	94448	94453	94458	94463	94468	94473	94478	94483	94488	94493
881	4498	4503	4507	4512	4517	4522	4527	4532	4537	4542
882	4547	4552	4557	4562	4567	4571	4576	4581	4586	4591
883	4596	4601	4606	4611	4616	4621	4626	4630	4635	4640
884	4645	4650	4655	4660	4665	4670	4675	4680	4685	4689
885	4694	4699	4704	4709	4714	4719	4724	4729	4734	4738
886	4743	4748	4753	4758	4763	4768	4773	4778	4783	4787
887	4792	4797	4802	4807	4812	4817	4822	4827	4832	4836
888	4841	4846	4851	4856	4861	4866	4871	4876	4880	4885
889	4890	4895	4900	4905	4910	4915	4919	4924	4929	4934
890	4939	4944	4949	4954	4959	4963	4968	4973	4978	4983
891	4988	4993	4998	5002	5007	5012	5017	5022	5027	5032
892	5036	5041	5046	5051	5056	5061	5066	5071	5075	5080
893	5085	5090	5095	5100	5195	5109	5114	5119	5124	5129
894	5134	5139	5143	5148	5153	5158	5163	5168	5173	5177
895	5182	5187	5192	5197	5202	5207	5211	5216	5221	5226
896	5231	5236	5240	5245	5250	5255	5260	5265	5270	5274
897	5279	5284	5289	5294	5299	5303	5308	5313	5318	5323
898	5328	5332	5337	5342	5347	5352	5357	5361	5366	5371
899	5376	5381	5386	5390	5395	5400	5405	5410	5415	5419
900	5424	5429	5434	5439	5444	5448	5453	5458	5463	5468
901	5472	5477	5482	5487	5492	5497	5501	5506	5511	5516
902	5521	5525	5530	5535	5540	5545	5550	5554	5559	5564
903	5569	5574	5578	5583	5588	5593	5598	5602	5607	5612
904	5617	5622	5626	5631	5636	5641	5646	5650	5655	5660
905	5665	5670	5674	5679	5684	5689	5694	5698	5703	5708
906	5713	5718	5722	5727	5732	5737	5742	5746	5751	5756
907	5761	5766	5770	5775	5780	5785	5789	5794	5799	5804
908	5809	5813	5818	5823	5828	5832	5837	5842	5847	5852
909	5856	5861	5866	5871	5875	5880	5885	5890	5895	5899
910	5904	5909	5914	5918	5923	5928	5933	5938	5942	5947
911	5952	5957	5961	5966	5971	5976	5980	5985	5990	5995
912	5999	6004	6009	6014	6019	6023	6028	6033	6038	6042
913	6047	6052	6057	6061	6066	6071	6076	6080	6085	6090
914	6095	6099	6104	6109	6114	6118	6123	6128	6133	6137
915	6142	6147	6152	6156	6161	6166	6171	6175	6180	6185
916	6190	6194	6199	6204	6209	6213	6218	6223	6227	6232
617	6237	6242	6246	6251	6256	6261	6265	6270	6275	6280
918	6284	6289	6294	6298	6303	6308	6313	6317	6322	6327
919	6332	6336	6341	6346	6350	6355	6360	6365	6369	6374
920	6379	6384	6388	6393	6398	6402	6407	6412	6417	6421
921	6426	6431	6435	6440	6445	6450	6454	6459	6464	6468
922	6473	6478	6483	6487	6492	6497	6501	6506	6511	6515
923	6520	6525	6530	6534	6539	6544	6548	6553	6558	6562
924	6567	6572	6577	6581	6586	6591	6595	6600	6605	6609
925	6614	6619	6624	6628	6633	6638	6642	6647	6652	6656
926	6661	6666	6670	6675	6680	6685	6689	6694	6699	6703
927	6708	6713	6717	6722	6727	6731	6736	6741	6745	6750
928	6755	6759	6764	6769	6774	6778	6783	6788	6792	6797
929	6802	6806	6811	6816	6820	6825	6830	6834	6839	6844
930	6848	6853	6858	6862	6867	6872	6876	6881	6886	6890
931	6895	6900	6904	6909	6914	6918	6923	6928	6932	6937
932	6942	6946	6951	6956	6960	6965	6970	6974	6979	6984
933	6988	6993	6997	7002	7007	7011	7016	7021	7025	7030
934	7035	7039	7044	7049	7053	7058	7063	7067	7072	7077
935	7081	7086	7090	7095	7100	7104	7109	7114	7118	7123
936	7128	7132	7137	7142	7146	7151	7155	7160	7165	7169
937	7174	7179	7183	7188	7192	7197	7202	7206	7211	7216
938	7220	7225	7230	7234	7239	7243	7248	7253	7257	7262
939	7267	7271	7276	7280	7285	7290	7294	7299	7304	7308
No.	0	1	2	3	4	5	6	7	8	9

No. 9400 —— 10000. Log. 97313——99996.

No.	0	1	2	3	4	5	6	7	8	9
940	97313	97317	97322	97327	97331	97336	97340	97345	97350	97354
941	7359	7364	7368	7373	7377	7382	7387	7391	7396	7400
942	7405	7410	7414	74 9	7424	7428	7433	7437	7442	7447
943	7451	7456	7460	7465	7470	7474	7479	7483	7488	7493
944	7497	7502	7506	7511	7516	7520	7525	7529	7534	7539
945	7543	7548	7552	7557	7562	7566	7571	7575	7580	7585
946	7589	7594	7598	7603	7607	7612	7617	7621	7626	7630
947	7635	7640	7644	7649	7653	7658	7663	7667	7672	7676
948	7681	7685	7690	7695	7699	7704	7708	7713	7717	7722
949	7727	7731	7736	7740	7745	7749	7754	7759	7763	7768
950	7772	7777	7782	7786	7791	7795	7800	7804	7809	7813
951	7818	7823	7827	7832	7836	7841	7845	7850	7855	7859
952	7864	7868	7873	7877	7882	7886	7891	7896	7900	7905
953	7909	7914	7918	7923	7928	7932	7937	7941	7946	7950
954	7955	7950	7964	7968	7973	7978	7982	7987	7991	7996
955	8000	8005	8009	8014	8019	8023	8028	8032	8037	8041
956	8046	8050	8055	8059	8064	8068	8073	8078	8082	8087
957	8091	8096	8100	8105	8109	8114	8118	8123	8127	8132
958	8137	8141	8146	8150	8155	8159	8164	8168	8173	8177
959	8182	8186	8191	8195	8200	8204	8209	8214	8218	8223
960	8227	8232	8236	8241	8245	8250	8254	8259	8263	8268
961	8272	8277	8281	8286	8290	8295	8299	8304	8308	8313
962	8318	8322	8327	8331	8336	8340	8345	8349	8354	8358
963	8363	8367	8372	8376	8381	8385	8390	8394	8399	8403
964	8408	8412	8417	8421	8426	8430	8435	8439	8444	8448
965	8453	8457	8462	8466	8471	8475	8480	8484	8489	8493
966	8498	8502	8507	8511	8516	8520	8525	8529	8534	8538
967	8543	8547	8552	8556	8561	8565	8570	8574	8579	8583
968	8588	8592	8597	8601	8605	8610	8614	8619	8623	8628
969	8632	8637	8641	8646	8650	8655	8659	8664	8668	8673
970	8677	8682	8686	8691	8695	8700	8704	8709	8713	8717
971	8722	8726	8731	8735	8740	8744	8749	8753	8758	8762
972	8767	8771	8776	8780	8784	8789	8793	8798	8802	8807
973	8811	8816	8820	8825	8829	8834	8838	8843	8847	8851
974	8856	8860	8865	8869	8874	8878	8883	8887	8892	8896
975	8900	8905	8909	8914	8918	8923	8927	8932	8936	8941
976	8945	8949	8954	8958	8963	8967	8972	8976	8981	8985
977	8989	8994	8998	9003	9007	9012	9016	9021	9025	9029
978	9034	9038	9043	047	052	056	061	065	069	074
979	9078	9083	9087	092	096	100	105	109	114	118
980	9123	9127	9131	136	140	145	149	154	158	162
981	9167	9171	9176	180	185	189	193	198	202	207
982	9211	9216	9220	224	229	233	238	242	247	251
983	9255	9260	9264	269	273	277	282	286	291	295
984	9300	9304	9308	313	317	322	326	330	335	339
985	9344	9348	9352	357	361	366	370	374	379	383
986	9388	9392	9396	401	405	410	414	419	423	427
987	9432	9436	9441	445	449	454	458	463	467	471
988	9476	9480	9484	489	493	498	502	506	511	515
989	9520	9524	9528	533	537	542	546	550	555	559
990	9564	9568	9572	5 7	581	585	590	594	599	603
991	9607	9612	9616	621	625	629	634	638	642	647
992	9651	9656	9660	664	669	673	677	682	686	691
993	9695	9699	9704	708	712	717	721	726	730	734
994	9739	9743	9747	752	756	760	765	760	774	778
995	9782	9787	9791	795	800	804	808	813	817	822
996	9826	9830	9835	839	843	848	852	856	861	865
997	9870	9874	9878	883	887	891	896	900	904	909
998	9913	9917	9922	926	930	935	939	944	948	952
999	9957	9961	9965	970	974	978	983	987	991	996
No.	0	1	2	3	4	5	6	7	8	9

0 Degree.

M	Sine	C. Sine	Tang.	C. Tang.	Secant	C. Sec.	M
0	0.00000	10.00000	0.00000	Infinite	10.00000	Infinite	60
5	7.16270	00	7.16270	12.83730	00	12.83730	55
10	46373	00	46373	53627	00	53627	50
15	63982	00	63982	36018	00	36018	45
20	76475	9.99999	76476	23524	01	23525	40
25	86166	99	86167	13833	01	13834	35
30	94084	98	94086	05914	02	05915	30
35	8.00779	9.99998	8.00781	11.99219	10.00002	11.99221	25
40	06578	97	06581	93419	03	93422	20
45	11693	96	11696	88304	04	88307	15
50	16268	95	16273	83727	05	83732	10
55	20407	94	20413	79587	06	79593	5
60	24186	93	24192	75808	07	75814	0
M	C. Sine	Sine	C Tang	Tang.	C. Sec.	Secant	M

89 Degrees.

1 Degree.

M	Sine	C.Sine	Tang.	C.Tang	Secant	C.Sec.	M
0	8.24186	9.99993	8.24192	11.75808	10.00007	11.75814	60
5	27661	92	27669	72331	08	72339	55
10	30879	91	30888	69112	09	69121	50
15	33875	89	33886	66114	11	66125	45
20	36678	88	36689	63311	12	63322	40
25	39310	87	39323	60677	13	60690	35
30	41792	85	41807	58193	15	58208	30
35	8.44139	9.99983	8.44156	11.55844	10.00017	11.55861	25
40	46366	82	46385	53615	18	53634	20
45	48485	80	48505	51495	20	51515	15
50	50505	78	50527	49473	22	49495	10
55	52434	76	52459	47541	24	47566	5
60	54282	74	54308	45692	26	45718	0
M	C.Sine	Sine	C.Tang	Tang.	C. Sec.	Secant	M

88 Degrees.

2 Degrees.

M	Sine	C.Sine.	Tang	C.Tang.	Secant	C.Sec.	M
0	8.54282	9.99974	8.54308	11.45692	10.00026	11.45718	60
5	56054	71	56083	43917	29	43946	55
10	57757	69	57788	42212	31	42243	50
15	59395	66	59428	40572	34	40605	45
20	60973	64	61009	38991	36	39027	40
25	62496	61	62535	37465	39	37504	35
30	63968	59	64009	35991	41	36032	30
35	8.65391	9.99956	8.65435	11.34565	10.00044	11.34609	25
40	66769	53	66816	33184	47	33231	20
45	68104	50	68154	31846	50	31896	15
50	69400	47	69453	30547	53	30600	10
55	70658	44	70714	29286	56	29342	5
60	71880	40	71940	28060	60	28120	0
M	C.Sine.	Sine	C.Tang	Tang.	C.Sec.	Secant	M

87 Degrees.

3 Degrees.

M	Sine	C.Sine.	Tang.	C.Tang.	Secant	C.Sec.	M
0	8.71880	9.99940	8.71940	11.28060	10.00060	11.28120	60
5	73069	37	73132	26868	63	26931	55
10	74226	34	74292	25708	66	25774	50
15	75353	30	75423	24577	70	24647	45
20	76451	26	76525	23475	74	23549	40
25	77522	23	77600	22400	77	22478	35
30	78567	19	78649	21351	81	21433	30
35	8.79588	9.99915	8.79673	11.20327	10.00085	11.20412	25
40	80585	11	80674	19326	89	19415	20
45	81560	07	81653	18347	93	18440	15
50	82513	03	82610	17390	97	17487	10
55	83446	99898	83547	16453	102	16554	5
60	84358	894	84464	15536	106	15642	0
M	C.Sine.	Sine	C.Tang	Tang.	C.Sec	Secant	M

86 Degrees.

4 Degrees.

M	Sine.	C. Sine	Tang.	C.Tang.	Secant	C. Sec	M
0	8.84358	9.99894	8.84464	11.15536	10 00106	11.15642	60
5	85252	890	85363	14637	110	14748	55
10	86128	885	86243	13757	115	13872	50
15	86987	880	87106	12894	120	13013	45
20	87829	876	87953	12047	124	12171	40
25	88654	871	88783	11217	129	11346	35
30	89464	866	89598	10402	134	10536	30
35	8.90260	9.99861	8 90399	11.09601	10.00139	11.09740	25
40	91040	856	91185	08815	144	08960	20
45	91807	851	91957	08043	149	08193	15
50	92561	845	92716	07284	155	07439	10
55	93302	840	93462	06538	160	06698	5
60	94030	834	94195	05805	166	05970	0
M	C. Sine	Sine	C.Tang	Tang.	C. Sec.	Secant	M

85 Degrees.

5 Degrees.

M	Sine.	C. Sine	Tang	C.Tang	Secant	C. Sec.	M
0	8.94030	9.99834	8.94195	11.05805	10 00166	11.05970	60
5	94746	829	94917	05083	171	05254	55
10	95450	823	95627	04373	177	04550	50
15	96143	817	96325	03675	183	03857	45
20	96825	812	97013	02987	188	03175	40
25	97496	806	97691	02309	194	02504	35
30	98157	800	98358	01642	200	01843	30
35	8.98808	9.99794	8.99015	11.00985	10.00206	11.01192	25
40	99450	787	99662	00338	213	00550	20
45	9.00082	781	9.00301	10.99699	219	10.99918	15
50	00704	775	00930	99070	225	99296	10
55	01318	768	01550	98450	232	98682	5
60	01923	761	02162	97838	239	98077	0
M	C. Sine	Sine.	C.Tang	Tang.	C. Sec.	Secant.	M

84 Degrees.

6 Degrees.

M	Sine.	C. Sine	Tang.	C.Tang	Secant.	C. Sec.	M
0	9.01924	9.99761	9.02162	10.97838	10.00239	10.98076	60
5	02520	755	02765	97235	245	97480	55
10	03109	748	03361	96639	252	96891	50
15	03690	741	03949	96051	259	96310	45
20	04263	734	04528	95472	266	95737	40
25	04828	727	05101	94899	273	95172	35
30	05386	720	05666	94334	280	94614	30
35	9.05937	9.99713	9.06224	10.93776	10.00287	10.94063	25
40	06481	705	06775	93225	295	93519	20
45	07018	698	07320	92680	302	92982	15
50	07548	690	07858	92142	310	92452	10
55	08072	683	08389	91611	317	91928	5
60	08589	675	08914	91086	325	91411	0
M	C. Sine	Sine	C.Tang	Tang.	C. Sec.	Secant	M

83 Degrees.

7 Degrees.

M	Sine	C. Sine	Tang.	C.Tang	Secant.	C. Sec.	M
0	9.08589	9.99675	9.08914	10.91086	10.00325	10 91411	60
5	09101	667	09434	90566	333	90899	55
10	09606	659	09947	90053	341	90394	50
15	10106	651	10454	89546	349	89894	45
20	10599	643	10956	89044	357	89401	40
25	11087	635	11452	88548	365	88913	35
30	11570	627	11943	88057	373	88430	30
35	9.12047	9.99618	9.12428	10.87572	10.00382	10.87953	25
40	12519	610	12909	87091	390	87481	20
45	12985	602	13384	86616	398	87015	15
50	13447	593	13854	86146	407	86553	10
55	13904	584	14320	85680	416	86096	5
60	14356	575	14780	85220	425	85644	0
M	C.Sine	Sine	C.Tang	Tang.	C. Sec.	Secant.	M

82 Degrees.

8 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C. Sec.	M
0	9.14356	9.99575	9.14780	10.85220	10.00425	10.85644	60
5	14803	566	15236	84764	434	85197	55
10	15245	557	15688	84312	443	84755	50
15	15683	548	16135	83865	452	84317	45
20	16116	539	16577	83423	461	83884	40
25	16545	530	17016	82984	470	83455	35
30	16970	520	17450	82550	480	83030	30
35	9.17391	9.99511	9 17880	10.82120	10.00489	10.82609	25
40	17807	501	18306	81694	499	82193	20
45	18220	492	18728	81272	508	81780	15
50	18628	482	19146	80854	518	81372	10
55	19033	472	19561	80439	528	80967	5
60	19433	462	19971	80029	538	80567	0
M	C.Sine	Sine.	C.Tang	Tang.	C.Sec.	Secant	M

81 Degrees.

9 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C. Sec.	M
0	9.19433	9.99462	9.19971	10.80029	10.00538	10.80567	60
5	19830	452	20378	79622	548	80170	55
10	20223	442	20782	79218	558	79777	50
15	20613	432	21182	78818	568	79387	45
20	20999	421	21578	78422	579	79001	40
25	21382	411	21971	78029	589	78618	35
30	21761	400	22361	77639	600	78239	30
35	9.22137	9.99390	9.22747	10.77253	10.00610	10.77863	25
40	22509	379	23130	76870	621	77491	20
45	22878	368	23510	76490	632	77122	15
50	23244	357	23887	76113	643	76756	10
55	23607	346	24261	75739	654	56393	5
60	23967	335	24632	75368	665	76033	0
M	C.Sine	Sine	C.Tang	Tang.	C. Sec.	Secant	M

80 Degrees.

10 Degrees.

M	Sine	C. Sine	Tang.	C.Tang.	Secant	C. Sec	M
0	9.23967	9.99335	9.24632	10.75368	10.00665	10.76033	60
5	24324	324	25000	75000	676	75676	55
10	24677	313	25365	74635	687	75323	50
15	25028	301	25727	74273	699	74972	45
20	25376	290	26086	73914	710	74624	40
25	25721	278	26443	73557	722	74279	35
30	26063	267	26797	73203	733	73937	30
35	9.26403	9.99255	9.27148	10.72852	10.00745	10.73597	25
40	26739	243	27496	72504	757	73261	20
45	27073	231	27842	72158	769	72927	15
50	27405	219	28186	71814	781	72595	10
55	27734	207	28527	71473	793	72266	5
60	28060	195	28865	71135	805	71940	0
M	C.Sine	Sine	C.Tang	Tang.	C. Sec.	Secant	M

79 Degrees.

11 Degrees.

M	Sine	C. Sine	Tang.	C Tang.	Secant	C.Sec.	M
0	9.28060	9.99195	9.28865	10.71135	10.00805	10.71940	60
5	28384	182	29201	70799	818	71616	55
10	28705	170	29535	70465	830	71295	50
15	29024	157	29866	70134	843	70976	45
20	29340	145	30195	69805	855	70660	40
25	29654	132	30522	69478	868	70346	35
30	29966	119	30846	69154	881	70034	30
35	9.30275	9.99106	9.31168	10 68832	10 00894	10.69725	25
40	30582	093	31489	68511	907	69418	20
45	30887	080	31806	68194	920	69113	15
50	31189	067	32122	67878	933	68811	10
55	31490	054	32436	67564	946	68510	5
60	31788	040	32748	67252	960	68212	0
M	C.Sine	Sine	C.Tang	Tang.	C. Sec	Secant	M

78 Degrees.

12 Degrees.

M	Sine	C. Sine	Tang.	C.Tang.	Secant	C. Sec.	M
0	9.31788	9.99040	9.32747	10.67253	10.00960	10.68212	60
5	32084	99027	33057	66943	00973	67916	55
10	32378	99013	33365	66635	00987	67622	50
15	32670	99000	33670	66330	01000	67330	45
20	32960	98986	33974	66026	01014	67040	40
25	33248	98972	34276	65724	01028	66752	35
30	33534	98958	34576	65424	01042	66466	30
35	9.33818	9.98944	9.84874	10.65126	10.01056	10.66182	25
40	34100	98930	35170	64830	01070	65900	20
45	34380	98916	35464	64536	01084	65620	15
50	34658	98901	35757	64243	01099	65342	10
55	34934	98887	36047	63953	01113	65066	5
60	35209	98872	36336	63664	01128	64791	0
M	C. Sine	Sine	C.Tang	Tang.	C. Sec	Secant	M

77 Degrees.

13 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C. Sec.	M
0	9.35209	9.98872	9.36336	10.63664	10.01128	10.64791	60
5	35482	98858	36624	63376	01142	64518	55
10	35752	98843	36909	63091	01157	64248	50
15	36022	98828	37193	62807	0117[illegible]	63978	45
20	36289	98813	37476	62524	01187	63711	40
25	36555	98798	37756	62244	01202	63445	35
30	36818	98783	38035	61965	01217	63182	30
35	9.37081	9.98768	9.38313	10.61687	10.01232	10.62919	25
40	37341	98753	38589	61411	01247	62659	20
45	37600	98737	38863	61137	01263	62400	15
50	37858	98722	39136	60864	01278	62142	10
55	38113	98706	39407	60593	01294	61887	5
60	38368	98690	39677	60323	01310	61632	0
M	C. Sine	Sine	C.Tang	Tang.	C. Sec.	Secant	M

76 Degrees.

14 Degrees.

M	Sine	C. Sine	Tang.	C.Tang.	Secant	C. Sec.	M
0	9.38368	9.98690	9.39677	10.60323	10.01310	10.61632	60
5	38620	98675	39945	60055	01325	61380	55
10	38871	98659	40212	59788	01341	61129	50
15	39121	98643	40478	59522	01357	60879	45
20	39369	98627	40742	59258	01373	60631	40
25	39615	98610	41004	58996	01390	60385	35
30	39860	98594	41266	58734	01406	60140	30
35	9.40104	9.98578	9.41526	10.58474	10.01422	10.59896	25
40	40345	98561	41784	58216	01439	59655	20
45	40586	98545	42042	57958	01455	59414	15
50	40825	98528	42297	57703	01472	59175	10
55	41063	98511	42552	57448	01489	58937	5
60	41300	98494	42805	57195	01506	58700	0
M	C. Sine	Sine	C.Tang	Tang	C. Sec.	Secant	M

75 Degrees.

15 Degrees.

M	Sine	C. Sine	Tang.	C.Tang	Secant	C. Sec.	M
0	9.41300	9.98494	9.42805	10.57195	10.01506	10.58700	60
5	41535	98477	43057	56943	01523	58465	55
10	41768	98460	43308	56692	01540	58232	50
15	42001	98443	43558	56442	01557	57999	45
20	42232	98426	43806	56194	01574	57768	40
25	42462	98409	44053	55947	01591	57538	35
30	42690	98391	44299	55701	01609	57310	30
35	9.42917	9.98374	9.44544	10.55456	10.01626	10.57083	25
40	43143	98356	44787	55213	01644	56857	20
45	43368	98338	45029	54971	01662	56632	15
50	43591	98320	45271	54729	01680	56409	10
55	43813	98302	45511	54489	01698	56187	5
60	44034	98284	45750	54250	01716	55966	0
M	C. Sine	Sine	C.Tang	Tang.	C. Sec.	Secant	M

74 Degrees.

16 Degrees

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C.Sec.	M
0	9.44034	9.98284	9.45750	10.54250	10.01716	10.55966	60
5	44253	98266	45987	54013	01734	55747	55
10	44472	98248	46224	53776	01752	55528	50
15	44689	98229	46460	53540	01771	55311	45
20	44905	98211	46694	53306	01789	55095	40
25	45120	98192	46928	53072	01808	54880	35
30	45334	98174	47160	52840	01826	54666	30
35	9.45547	9.98155	9.47392	10.52608	10.01845	10.54453	25
40	45758	98136	47622	52378	01864	54242	20
45	45969	98117	47852	52148	01883	54031	15
50	46178	98098	48080	51920	01902	53822	10
55	46386	98079	48307	51693	01921	53614	5
60	46594	98060	48534	51466	01940	53406	0
M	C.Sine	Sine	C.Tang.	Tang	C.Sec.	Secant	M

73 Degrees

17 Degrees

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C.Sec.	M
0	9.46594	9.98060	9.48534	10.51466	10 01940	10.53406	60
5	46800	98040	48759	51241	01960	53200	55
10	47005	98021	48984	51016	01979	52995	50
15	47209	98001	49207	50793	01999	52791	45
20	47412	97982	49430	50570	02018	52588	40
25	47613	97962	49652	50348	02038	52387	35
30	47814	97942	49872	50128	02058	52186	30
35	9.48014	9.97922	9.50092	10.49908	10.02078	10.51986	25
40	48213	97902	50311	49689	02098	51787	20
45	48411	97882	50529	49471	02118	51589	15
50	48608	97861	50746	49254	02139	51392	10
55	48803	97841	50962	49038	02159	51197	5
60	48998	97821	51178	48822	02179	51002	0
M	C.Sine	Sine	C Tang	Tang.	C.Sec.	Secant.	M

72 Degrees.

18 Degrees.

M	Sine	C. Sine	Tang.	C.Tang.	Secant	C. Sec.	M
0	9.48998	9.97821	9.51178	10.48822	10.02179	10.51002	60
5	49192	97800	51392	48608	02200	50808	55
10	49385	97779	51606	48394	02221	50615	50
15	49577	97759	51819	48181	02241	50423	45
20	49768	97738	52031	47969	02262	50232	40
25	49958	97717	52242	47758	02283	50042	35
30	50148	97696	52452	47548	02304	49852	30
35	9.50336	9.97674	9.52661	10.47339	10 02326	10.49664	25
40	50523	97653	52870	47130	02347	49477	20
45	50710	97632	53078	46922	02368	49290	15
50	50896	97610	53285	46715	02390	49104	10
55	51080	97589	53492	46508	02411	48920	5
60	51264	97567	53697	46303	02433	48736	0
M	C. Sine	Sine	C.Tang	Tang.	C. Sec.	Secant	M

71 Degrees.

19 Degrees.

M	Sine	C. Sine	Tang.	C.Tang	Secant	C. Sec.	M
0	9 51264	9.97567	9.53697	10.46303	10.02433	10.48736	60
5	51447	97545	53902	46098	02455	48553	55
10	51629	97523	54106	45894	02477	48371	50
15	51811	97501	54309	45691	02499	48189	45
20	51991	97479	54512	45488	02521	48009	40
25	52171	97457	54714	45286	02543	47829	35
30	52350	97435	54915	45085	02565	47650	30
35	9.52527	9.97412	9.55115	10.44885	10.02588	10.47473	25
40	52705	97390	55315	44685	02610	47295	20
45	52881	97367	55514	44486	02633	47119	15
50	53056	97344	55712	44288	02656	46944	10
55	53231	97322	55910	44090	02678	46769	5
60	53405	97299	56107	43893	02701	46595	0
M	C. Sine	Sine	C.Tang	Tang.	C. Sec.	Secant	M

70 Degrees.

20 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C. Sec	M
0	9.53405	9.97299	9.56107	10.43893	10.02701	10.46595	60
5	53578	97275	56303	43697	02725	46422	55
10	53751	97252	56498	43502	02748	46249	50
15	53922	97229	56693	43307	02771	46078	45
20	54093	97206	56887	43113	02794	45907	40
25	54263	97182	57081	42919	02818	45737	35
30	54433	97159	57274	42726	02841	45567	30
35	9.54601	9.97135	9.57466	10.42534	10.02865	10.45399	25
40	54769	97111	57658	42342	02889	45231	20
45	54936	97087	57849	42151	02913	45064	15
50	55102	97063	58039	41961	02937	44898	10
55	55268	97039	58229	41771	02961	44732	5
60	55433	97015	58418	41582	02985	44567	0
M	C. Sine	Sine	C.Tang	Tang.	C. Sec	Secant	M

69 Degrees.

21 Degrees.

M	Sine	C. Sine	Tang.	C.Tang	Secant	C. Sec.	M
0	9.56433	9.97015	9.58418	10.41582	10.02985	10 44567	60
5	55597	96991	58606	41394	03009	44403	55
10	55761	96966	58794	41206	03034	44239	50
15	55923	96942	58981	41019	03058	44077	45
20	56085	96917	59168	40832	03083	43915	40
25	56247	96893	59354	40646	03107	43753	35
30	56408	96868	59540	40460	03132	43592	30
35	9.56568	9.96843	9.59725	10.40275	10.03157	10 43432	25
40	56727	96818	59909	40091	03182	43273	20
45	56886	96793	60093	39907	03207	43114	15
50	57044	96767	60276	39724	03233	42956	10
55	57201	96742	60459	39541	03258	42799	5
60	57358	96717	60641	39359	03283	42642	0
M	C. Sine.	Sine	C.Tang	Tang.	C.Sec.	Secant	M

68 Degrees.

22 Degrees.

M	Sine	C. Sine	Tang.	C.Tang.	Secant	C.Sec	M
0	9.57358	9.96717	9.60641	10.39359	10.03283	10 42642	60
5	57514	96691	60823	39177	03309	42486	55
10	57669	96665	61004	38996	03335	42331	50
15	57824	96640	61184	38816	03360	42176	45
20	57978	96614	61364	38636	03386	42022	40
25	58131	96588	61544	38456	03412	41869	35
30	58284	96562	61722	38278	03438	41716	30
35	9.58436	9.96535	9.61901	10.38099	10 03465	10 41564	25
40	58588	96509	62079	37921	03491	41412	20
45	58739	96483	62256	37744	03517	41261	15
50	58889	96456	62433	37567	03544	41111	10
55	59039	96429	62609	37391	03571	40961	5
60	59188	96403	62785	37215	03597	40812	0
M.	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

67 Degrees

23 Degrees.

M	Sine	C. Sine.	Tang.	C.Tang.	Secant	C.Sec.	M
0	9.59188	9.96403	9 62785	10.37215	10.03597	10.40812	60
5	59336	96376	62961	37039	03624	40664	55
10	59484	96349	63135	36865	03651	40516	50
15	59632	96322	63310	36690	03678	40368	45
20	59778	96294	63484	36516	03706	40222	40
25	59924	96267	63657	36343	03733	40076	35
30	60070	96240	63830	36170	03760	39930	30
35	9.60215	9.96212	9 64003	10.35997	10.03788	10.39785	25
40	60359	96185	64175	35825	03815	39641	20
45	60503	96157	64346	35654	03843	39497	15
50	60646	96129	64517	35483	03871	39354	10
55	60789	96101	64688	35312	03899	39211	5
60	60931	96073	64858	35142	03927	39069	0
M	C. Sine	Sine	C.Tang	Tang.	C. Sec.	Secant	M

66 Degrees.

24 Degrees

M	Sine	C.Sine	Tang.	C Tang.	Secant.	C.Sec.	M
0	9.60931	9.96073	9.64858	10.35142	10.03927	10.39069	60
5	61075	96045	65028	4972	03955	38927	55
10	61214	96017	65197	34803	03983	38786	50
15	61354	95988	65366	34634	04012	38646	45
20	61494	95960	65535	34465	04040	38506	40
25	61634	95931	65703	34297	04069	38366	35
30	61773	95902	65870	34130	04098	38227	30
35	9.61911	9.95873	9.66038	10.33962	10 04127	10.38089	25
40	62049	95844	66204	33796	04156	37951	20
45	62186	95815	66371	33629	04185	37814	15
50	62323	95786	66537	33463	04214	37677	10
55	62459	95757	66702	33298	04243	37541	5
60	62595	95728	66867	33133	04272	37405	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

65 Degrees

25 Degrees

M	Sine	C.Sine	Tang	C.Tang	Secant	C.Sec.	M
0	9.62595	9.95728	9.66867	10 33133	10 04272	10 37405	60
5	62730	95698	67032	32968	04302	37270	55
10	62865	95668	67196	32804	04332	37135	50
15	62999	95639	67360	32640	04361	37001	45
20	63133	95609	67524	32476	04391	36867	40
25	63266	95579	67687	32313	04421	36734	35
30	63398	95549	67850	32150	04451	36602	30
35	9.63531	9.95519	9.68012	10.31988	10.04481	10.36469	25
40	63662	95488	68174	31826	04512	36338	20
45	63794	95458	68336	31664	04542	36206	15
50	63924	95427	68497	31503	04573	36076	10
55	64054	95397	68658	31342	04603	35946	5
60	64184	95366	68818	31182	04634	35816	0
M	C.Sine	Sine	C.Tang	Tang	C.Sec.	C. Sec.	M

64 Degrees.

26 Degrees.

M	Sine	C. Sine	Tang.	C.Tang.	Secant	C.Sec.	M
0	9.64184	9.95366	9.68818	10.31182	10.04634	10 35816	60
5	64313	95335	68978	31022	04665	35687	55
10	64442	95304	69138	30862	04696	35558	50
15	64571	95273	69298	30702	04727	35429	45
20	64698	95242	69457	30543	04758	35302	40
25	64826	95211	69615	30385	04789	35174	35
30	64953	95179	69774	30226	04821	35047	30
35	9.65079	9.95148	9.69932	10.30068	10.04852	10.34921	25
40	65205	95116	70089	29911	04884	34795	20
45	65331	95084	70247	29753	04916	34669	15
50	65456	95052	70404	29596	04948	34544	10
55	65580	95020	70560	29440	04980	34420	5
60	65705	94988	70717	29283	05012	34295	0
M	C. Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

63 Degrees.

27 Degrees.

M	Sine	C.Sine	Tang.	C Tang.	Secant	C.Sec.	M
0	9.6570^{5}	9.94988	9.70717	10.29283	10.05012	10 34295	60
5	65828	94956	70873	29127	05044	34172	55
10	65952	94923	71028	28972	05077	34048	50
15	66075	94891	71184	28816	05109	33925	45
20	66197	94858	71339	28661	05142	33803	40
25	66319	94826	71493	28507	05174	33681	35
30	66441	94793	71648	28352	05207	33559	30
35	9.6656$_{2}$	9.94760	9.71802	10.28198	10.05240	10.33438	25
40	6668$_{2}$	94727	71955	28045	05273	33313	20
45	6680$_{3}$	94694	72109	27891	05306	33197	15
50	6692$_{2}$	94660	72262	27738	05340	33078	10
55	6704$_{2}$	94627	72415	27585	05373	32958	5
60	6716$_{1}$	94593	72567	27433	05407	32839	0
M	C.Sine	Sine	C.Tang	Tang	C. Sec.	Secant	M

62 Degrees.

28 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C.Sec.	M
0	9.67161	9.94593	9.72567	10.27433	10.05407	10.32839	60
5	67280	94560	72720	27280	05440	32720	55
10	67398	94526	72872	27128	05474	32602	50
15	67515	94492	73023	26977	05508	32485	45
20	67633	94458	73175	26825	05542	32367	40
25	67750	94424	73326	26674	05576	32250	35
30	67866	94390	73476	26524	05610	32134	30
35	9.67982	9.94355	9.73627	10.26373	10.05645	10.32018	25
40	68098	94321	73777	26223	05679	31902	20
45	68213	94286	73927	26073	05714	31787	15
50	68328	94252	74077	25923	05748	31672	10
55	68443	94217	74226	25774	05783	31557	5
60	68557	94182	74375	25625	05818	31443	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

61 Degrees

29 Degrees.

M	Sine	C. Sine	Tang.	C.Tang	Secant	C.Sec.	M
0	9.68557	9.94182	9.74375	10.25625	10.05818	10.31443	60
5	68671	94147	74524	25476	05853	31329	55
10	68784	94112	74673	25327	05888	31216	50
15	68897	94076	74821	25179	05924	31103	45
20	69010	94041	74969	25031	05959	30990	40
25	69122	94005	75117	24883	05995	30878	35
30	69234	93970	75264	24736	06030	30766	30
35	9.69345	9.93934	9.75411	10.24589	10.06066	10.30655	25
40	69456	93898	75558	24442	06102	30544	20
45	69567	93862	75705	24295	06138	30433	15
50	69677	93826	75852	24148	06174	30323	10
55	69787	93789	75998	24002	06211	30213	5
60	69897	93753	76144	23856	06247	30103	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

60 Degrees.

30 Degrees.

M	Sine	C Sine	Tang.	C.Tang	Secant	C.Sec	M
0	9.69897	9.93753	9.76144	10.23856	10.06247	10.30103	60
5	70006	93717	76290	23710	06283	29994	55
10	70115	93680	76435	23565	06320	29885	50
15	70224	93643	76580	23420	06357	29776	45
20	70332	93606	76725	23275	06394	29668	40
25	70439	93569	76870	23130	06431	29561	35
30	70547	93532	77015	22985	06468	29453	30
35	9.70654	9.93495	9.77159	10.22841	10.06505	10.29346	25
40	70761	93457	77303	22697	06543	29239	20
45	70867	93420	77447	22553	06580	29133	15
50	70973	93382	77591	22409	06618	29027	10
55	71079	93344	77734	22266	06656	28921	5
60	71184	93307	77877	22123	06693	28816	0
M	C.Sine	Sine.	C.Tang	Tang.	C.Sec.	Secant	M

59 Degrees.

31 Degrees.

M	Sine	C.Sine	Tang.	C Tang.	Secant	C. Sec.	M
0	9.71184	9.93307	9.77877	10.22123	10.06693	10.28816	60
5	71289	93269	78020	21980	06731	28711	55
10	71393	93230	78163	21837	06770	28607	50
15	71498	93192	78306	21694	06808	28502	45
20	71602	93154	78448	21552	06846	28398	40
25	71705	93115	78590	21410	06885	28295	35
30	71809	93077	78732	21268	06923	28191	30
35	9.71911	9.93038	9.78873	10.21126	10.06962	10.28089	25
40	72014	92999	79015	20985	07001	27986	20
45	72116	92960	79156	20844	07040	27884	15
50	72218	92921	79297	20703	07079	27782	10
55	72320	92881	79438	20562	07119	27680	5
60	72421	92842	79579	20421	07158	27579	0
M	C. Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

58 Degrees.

32 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C.Sec.	M
0	9.72421	9.92842	9.79579	10.20421	10.07158	10.27579	60
5	72522	92803	79719	20281	07197	27478	55
10	72622	92763	79860	20140	07237	27378	50
15	72723	92723	80000	20000	07277	27277	45
20	72823	92683	80140	19860	07317	27177	40
25	72922	92643	80279	19721	07357	27078	35
30	73022	92603	80419	19581	07397	26978	30
35	9 73121	9.92563	9.80558	10.19442	10.07437	10.26879	25
40	73219	92522	80697	19303	07478	26781	20
45	73318	92482	80836	19164	07518	26682	15
50	73416	92441	80975	19025	07559	26584	10
55	73513	92400	81113	18887	07600	26487	5
60	73611	92359	81252	18748	07641	26389	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

57 Degrees.

33 Degrees.

M	Sine	C.Sine	Tang.	C.Tang	Secant	C.Sec.	M
0	9.73611	9.92359	9.81252	10.18748	10.07641	10.26389	60
5	73708	92318	81390	18610	07682	26292	55
10	73805	92277	81528	18472	07723	26195	50
15	73901	92235	81666	18334	07765	26099	45
20	73997	92194	81803	18197	07806	26003	40
25	74093	92152	81941	18059	07848	25907	35
30	74189	92111	82078	17922	07889	25811	30
35	9.74284	9.92069	9.82215	10.17785	10.07931	10.25716	25
40	74379	92027	82352	17648	07973	25621	20
45	74474	91985	82489	17511	08015	25526	15
50	74568	91942	82626	17374	08058	25432	10
55	74662	91900	82762	17238	08100	25338	5
60	74756	91857	82899	17101	08143	25244	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

56 Degrees

34 Degrees.

M	Sine	C.Sine	Tang.	C Tang.	Secant	C.Sec.	M
0	9.74756	9.91857	9.82899	10.17101	10.08143	10.25244	60
5	74850	91815	83035	16965	08185	25150	55
10	74943	91772	83171	16829	08228	25057	50
15	75036	91729	83307	16693	08271	24964	45
20	75128	91686	83442	16558	08314	24872	40
25	75221	91643	83578	16422	08357	24779	35
30	75313	91599	83713	16287	08401	24687	30
35	9.75405	9.91556	9.83849	10.16151	10.08444	10.24595	25
40	75496	91512	83984	16016	08488	24504	20
45	75587	91469	84119	15881	08531	24413	15
50	75678	91425	84254	15746	08575	24322	10
55	75769	91381	84388	15612	08619	24231	5
60	75859	91336	84523	15477	08664	24141	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

55 Degrees.

35 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C.Sec.	M
0	9.75859	9.91336	9.84523	10.15477	10.08664	10.24141	60
5	75949	91292	84657	15343	08708	24051	55
10	76039	91248	84791	15209	08752	23961	50
15	76129	91203	84925	15075	08797	23871	45
20	76218	91158	85059	14941	08842	23782	40
25	76307	91114	85193	14807	08886	23693	35
30	76395	91069	85327	14673	08931	23605	30
35	9.76484	9.91023	9.85460	10.14540	10 08977	10 23516	25
40	76572	90978	85594	14406	09022	23428	20
45	76660	90933	85727	14273	09067	23340	15
50	76747	90887	85860	14140	09113	23258	10
55	76835	90842	85993	14007	09159	23165	5
60	76922	90796	86126	13874	09204	23078	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec	Secant	M

54 Degrees.

36 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C.Sec.	M
0	9.76922	9.90796	9.86126	10.13874	10.09204	10.23078	60
5	77009	90750	86259	13741	09250	22991	55
10	77095	90704	86392	13608	09296	22905	50
15	77181	90657	86524	13476	09343	22819	45
20	77268	90611	86656	13344	09389	22732	40
25	77353	90565	86789	13211	09435	22647	35
30	77439	90518	86921	13079	09482	22561	30
35	9.77524	9.90471	9.87053	10.12947	10.09529	10.22476	25
40	77609	90424	87185	12815	09576	22391	20
45	77694	90377	87317	12683	09623	22306	15
50	77778	90330	87448	12552	09670	22222	10
55	77862	90282	87580	12420	09718	22138	5
60	77946	90235	87711	12289	09765	22054	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

53 Degrees.

37 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C.Sec.	M
0	9.77946	9.90235	9.87711	10.12289	10.09765	10.22054	60
5	78030	90187	87843	12157	09813	21970	55
10	78113	90139	87974	12026	09861	21887	50
15	78197	90091	88105	11895	09909	21803	45
20	78280	90043	88236	11764	09957	21720	40
25	78362	89995	88367	11633	10005	21638	35
30	78445	89947	88498	11502	10053	21555	30
35	9.78527	9.89898	9.88629	10.11371	10.10102	10.21473	25
40	78609	89849	88759	11241	10151	21391	20
45	78691	89801	88890	11110	10199	21309	15
50	78772	89752	89020	10980	10248	21228	10
55	78853	89702	89151	10849	10298	21147	5
60	78934	89653	89281	10719	10347	21066	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

52 Degrees.

38 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant	C.Sec.	M
0	9.78934	9.89653	9.89281	10.10719	10.10347	10.21066	60
5	79015	89604	89411	10589	10396	20985	55
10	79095	89554	89541	10459	10446	20905	50
15	79176	89504	89671	10329	10496	20824	45
20	79256	89455	89801	10199	10545	20744	40
25	79335	89405	89931	10069	10595	20665	35
30	79415	89354	90061	09939	10646	20585	30
35	9.79494	9.89304	9.90190	10.09810	10.10696	10.20506	25
40	79573	89254	90320	09680	10746	20427	20
45	79652	89203	90449	09551	10797	20348	15
50	79731	89152	90578	09422	10848	20269	10
55	79809	89101	90708	09292	10899	20191	5
60	79887	89050	90837	09163	10950	20113	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

51 Degrees.

39 Degrees.

M	Sine	C.Sine	Tang.	C.Tang	Secant	C.Sec.	M
0	9.79887	9.89050	9.90837	10.09163	10.10950	10.20113	60
5	79965	88999	90966	09034	11001	20035	55
10	80043	88948	91095	08905	11052	19957	50
15	80120	88896	91224	08776	11104	19880	45
20	80197	88844	91353	08647	11156	19803	40
25	80274	88793	91482	08518	11207	19726	35
30	80351	88741	91610	08390	11259	19649	30
35	9.80428	9.88688	9.91739	10.08261	10.11312	10.19572	25
40	80504	88636	91868	08132	11364	19496	20
45	80580	88584	91996	08004	11416	19420	15
50	80656	88531	92125	07875	11469	19344	10
55	80731	88478	92253	07747	11522	19269	5
60	80307	88425	92381	07619	11575	19193	0
M	C.Sine	Sine	C.Tang	Tang	C.Sec.	Secant	M

50 Degrees.

40 Degrees.

M	Sine.	C.Sine.	Tang.	C.Tang.	Secant.	C. Sec	M
0	9.80807	9.88425	9.92381	10.07619	10.11575	10.19193	60
5	80882	88372	92510	07490	11628	19118	55
10	80957	88319	92638	07362	11681	19043	50
15	81032	88266	92766	07234	11734	18968	45
20	81106	88212	92894	07106	11788	18894	40
25	81180	88158	93022	06978	11842	18820	35
30	81254	88105	93150	06850	11895	18746	30
35	9.81328	9.88050	9.93278	10.06722	10.11950	10.18672	25
40	81402	87996	93406	06594	12004	18598	20
45	81475	87942	93533	06467	12058	18525	15
50	81549	87887	93661	06339	12113	18451	10
55	81622	87833	93789	06211	12167	18378	5
60	81694	87778	93916	06084	12222	18306	0
M	C. Sine	Sine.	C.Tang	Tang.	C. Sec.	Secant.	M

49 Degrees.

41 Degrees.

M	Sine	C. Sine	Tang.	C.Tang	Secant	C. Sec.	M
0	9.81694	9.87778	9.93916	10.06084	10.12222	10.18306	60
5	81767	87723	94044	05956	12277	18233	55
10	81839	87668	94171	05829	12332	18161	50
15	81911	87613	94299	05701	12387	18089	45
20	81983	87557	94426	05574	12443	18017	40
25	82055	87501	94554	05446	12499	17945	35
30	82126	87446	94681	05319	12554	17874	30
35	9 82198	9.87390	9.94808	10.05192	10.12610	10.17802	25
40	82269	87334	94935	05065	12666	17731	20
45	82340	87277	95062	04938	12723	17660	15
50	82410	87221	95190	04810	12779	17590	10
55	82481	87164	95317	04683	12836	17519	5
60	82551	87107	95444	04556	12893	17449	0
M	C. Sine	Sine.	C.Tang	Tang.	C. Sec.	Sec ant.	M

48 Degrees.

42 Degrees.

M	Sine.	C. Sine	Tang.	C.Tang	Secant.	C. Sec.	M
0	9.82551	9.87107	9.95444	10.04556	10 12893	10.17449	60
5	82621	87050	95571	04429	12950	17379	55
10	82691	86993	95698	04302	13007	17309	50
15	82761	86936	95825	04175	13063	17239	45
20	82830	86879	95952	04048	13121	17170	40
25	82899	86821	96078	03922	13179	17101	35
30	82968	86763	96205	03795	13237	17032	30
35	9.83037	9.86705	9.96332	10.03668	10.13295	10.16963	25
40	83106	86647	96459	03541	13353	16894	20
45	83174	86589	96586	03414	13411	16826	15
50	83242	86530	96712	03288	13470	16758	10
55	83310	86472	96839	03161	13528	16690	5
60	83378	86413	96966	03034	13587	16622	0
M	C. Sine	Sine.	C.Tang	Tang	C. Sec.	Secant.	M

47 Degrees.

43 Degrees.

M	Sine	C.Sine	Tang.	C.Tang.	Secant.	C. Sec.	M
0	9.83378	9.86413	9.96966	10.03034	10.13587	10.16622	60
5	83446	86354	97092	02908	13646	16554	55
10	83513	86295	97219	02781	13705	16487	50
15	83581	86235	97345	02655	13765	16419	45
20	83648	86176	97472	02528	13824	16352	40
25	83715	86116	97598	02402	13884	16285	35
30	83781	86056	97725	02275	13944	16219	30
35	9.83848	9.85996	9.97851	10.02149	10.14004	10.16152	25
40	83914	85936	97978	02022	14064	16086	20
45	83980	85876	98104	01896	14124	16020	15
50	84046	85815	98231	01769	14185	15954	10
55	84112	85754	98357	01643	14246	15888	5
60	84177	85693	98484	01516	14307	15823	0
M	C.Sine	Sine	C.Tang	Tang.	C.Sec.	Secant	M

46 Degrees.

44 Degrees.

M	Sine	C .Sine	Tang	C.Tang	Secant	C. Sec.	M
0	9.84177	9.85693	9.98484	10.01516	10.14307	10.15823	60
5	84242	85632	98610	01390	14368	15758	55
10	84308	85571	98737	01263	14429	15692	50
15	84373	85510	98863	01137	14490	15627	45
20	84437	85448	98989	01011	14552	15563	40
25	84502	85386	99116	00884	14614	15498	35
30	84566	85324	99242	00758	14676	15434	30
35	9.84630	9.85262	9.99368	10.00632	10.14738	10.15370	25
40	84694	85200	99495	00505	14800	15306	20
45	84758	85137	99621	00379	14863	15242	15
50	84822	85074	99747	00253	14926	15178	10
55	84885	85012	99874	00126	14988	15115	5
60	84949	84949	10.00000	10.00000	15051	15051	0
M	C. Sine	Sine	C.Tang	Tang	C. Sec.	Secant	M

45 Degrees.

* * *

III. A TRAVERSE TABLE, or TABLE OF DIFFERENCE OF LATITUDE AND DEPARTURE, calculated for Degrees and Quarters of Degrees, and for any Distance up to 70 Rods, Chains, &c.; by which the Northings and Southings, Eastings and Westings made in a Survey may be found.

Note. Northings and Southings are called Difference of Latitude, or simply Latitude; Eastings and Westings are called Departure, Meridian Distance, or Longitude.

Explanation of the Table.

To find the Latitude and Departure, or Northing, &c. for any Course and Distance.

If the Course be less than 45°, look for it at the Top, but if more than 45° at the Bottom of the Page; and look for the Distance in the Right or Left hand Column: against the Distance, and directly under or over the Course, stand the Northing, &c. in whole numbers and Decimals.

If the Course be less than 45°, the Northing or Southing will be greater than the Easting or Westing; but if more than 45°, the Easting or Westing will be the greatest.

When the Distance exceeds 70, divide it by 2, 3, or 4, that is, take one half, one third, or one fourth of it, and multiply the Latitude and Departure by the number by which the Distance was divided: Or, take any two or more numbers, which added together will equal the Distance, and find the Latitude and Departure for each of those numbers; add the Several Latitudes together and the sum will be the whole Latitude; and so for the Departure. And when the Distance is in Chains and Links, or whole Numbers and Decimals, find the Latitude, &c. for the Chains or whole Numbers, and then for the Links or Decimals, remembering to remove the Decimal Point in the Table further to the Left, according to the given Decimal.

EXAMPLES.

1. *Required the Latitude and Departure for* 45 *Rods, on a Course N.* 15° 15' *W.*

Under 15° 15' and against 45 is 43.42 for the Northing and 11.84 for the Westing.

2. *Required the Latitude and Departure for* 120 *Rods, on a Course S.* 58° 30' *E.*

Take one third of 120 which is 40; against this number, over 58° 30' is 29.90 for the Latitude and 34.11 for the Departure. These multiplied by 3 give 62.70 for the Southing and 102.33 for the Easting.

3. *Required the Latitude and Departure for* 37.36 *Rods or* 37 *Chains and* 36 *Links, on a Course N.* 26° 45' *E.*

For	37.	Lat.	33.04	Dep.	16.65
	0.36		.32		.16
	37.36		33.36		16.81

Northing 33.36 Easting 16.81

Note. When the Minutes are not 15, 30 or 45, the Northings, &c. must be calculated by Natural Sines, or by Trigonometry.

Dist.	0° 15′		0° 30′		0° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1.00	0.00	1.00	0.01	1.00	0.01	1
2	2.00	0.01	2.00	0.02	2.00	0.03	2
3	3.00	0.01	3.00	0.03	3.00	0.04	3
4	4.00	0.02	4.00	0.03	4.00	0.05	4
5	5.00	0.02	5.00	0.04	5.00	0.07	5
6	6.00	0.03	6.00	0.05	6.00	0.08	6
7	7.00	0.03	7.00	0.06	7.00	0.09	7
8	8.00	0.03	8.00	0.07	8.00	0.10	8
9	9.00	0.04	9.00	0.08	9.00	0.12	9
10	10.00	0.04	10.00	0.09	10.00	0.13	10
11	11.00	0.05	11.00	0.10	11.00	0.14	11
12	12.00	0.05	12.00	0.10	12.00	0.16	12
13	13.00	0.06	13.00	0.11	13.00	0.17	13
14	14.00	0.06	14.00	0.12	14.00	0.18	14
15	15.00	0.07	15.00	0.13	15.00	0.20	15
16	16.00	0.07	16.00	0.14	16.00	0.21	16
17	17.00	0.07	17.00	0.15	17.00	0.22	17
18	18.00	0.08	18.00	0.16	18.00	0.24	18
19	19.00	0.08	19.00	0.17	19.00	0.25	19
20	20.00	0.09	20.00	0.17	20.00	0.26	20
21	21.00	0.09	21.00	0.18	21.00	0.27	21
22	22.00	0.10	22.00	0.19	22.00	0.29	22
23	23.00	0.10	23.00	0.20	23.00	0.30	23
24	24.00	0.10	24.00	0.21	24.00	0.31	24
25	25.00	0.11	25.00	0.22	25.00	0.33	25
26	26.00	0.11	26.00	0.23	26.00	0.34	26
27	27.00	0.12	27.00	0.24	27.00	0.35	27
28	28.00	0.12	28.00	0.24	28.00	0.37	28
29	29.00	0.13	29.00	0.25	29.00	0.38	29
30	30.00	0.13	30.00	0.26	30.00	0.39	30
31	31.00	0.14	31.00	0.27	31.00	0.41	31
32	32.00	0.14	32.00	0.28	32.00	0.42	32
33	33.00	0.14	33.00	0.29	33.00	0.43	33
34	33.00	0.15	34.00	0.30	34.00	0.45	34
35	35.00	0.15	35.00	0.31	35.00	0.46	35
36	36.00	0.16	36.00	0.31	36.00	0.47	36
37	37.00	0.16	37.00	0.32	37.00	0.48	37
38	38.00	0.17	38.00	0.33	38.00	0.50	38
39	39.00	0.17	39.00	0.34	39.00	0.51	39
40	40.00	0.17	40.00	0.35	40.00	0.52	40
41	41.00	0.18	41.00	0.36	41.00	0.54	41
42	42.00	0.18	42.00	0.37	42.00	0.55	42
43	43.00	0.19	43.00	0.38	43.00	0.56	43
44	44.00	0.19	44.00	0.38	44.00	0.58	44
45	45.00	0.20	45.00	0.39	45.00	0.59	45
46	46.00	0.20	46.00	0.40	46.00	0.60	46
47	47.00	0.20	47.00	0.41	47.00	0.62	47
48	48.00	0.21	48.00	0.42	48.00	0.63	48
49	49.00	0.21	49.00	0.43	49.00	0.64	49
50	50.00	0.22	50.00	0.44	50.00	0.65	50
51	51.00	0.22	51.00	0.45	50.99	0.67	51
52	52.00	0.23	52.00	0.45	51.99	0.68	52
53	53.00	0.23	53.00	0.46	52.99	0.69	53
54	54.00	0.24	54.00	0.47	53.99	0.71	54
55	55.00	0.24	55.00	0.48	54.99	0.72	55
56	56.00	0.24	56.00	0.49	55.99	0.73	56
57	57.00	0.25	57.00	0.50	56.99	0.75	57
58	58.00	0.25	58.00	0.51	57.99	0.76	58
59	59.00	0.26	59.00	0.51	58.99	0.77	59
60	60.00	0.26	60.00	0.52	59.99	0.79	60
61	61.00	0.27	61.00	0.53	60.99	0.80	61
62	62.00	0.27	62.00	0.54	61.99	0.81	62
63	63.00	0.28	63.00	0.55	62.99	0.82	63
64	64.00	0.28	64.00	0.56	63.99	0.84	64
65	65.00	0.28	65.00	0.57	64.99	0.85	65
66	66.00	0.29	66.00	0.58	65.99	0.86	66
67	67.00	0.29	67.00	0.58	66.99	0.88	67
68	68.00	0.30	68.00	0.59	67.99	0.89	68
69	69.00	0.30	69.00	0.60	68.99	0.90	69
70	70.00	0.31	70.00	0.61	69.99	0.92	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	89° 45′		89° 30′		89° 15′		

Dist.	1° 0′		1° 15′		1° 30′		1° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1.00	0.02	1.00	0 02	1.00	0.03	1.00	0.03	1
2	2.00	0.03	2.00	0.04	2.00	0.05	2.00	0.06	2
3	3.00	0 05	3.00	0.07	3.00	0 08	3.00	0.09	3
4	4.00	0.07	4.00	0.09	4.00	0.10	4.00	0.12	4
5	5.00	0.09	5.00	0.11	5.00	0.13	5.00	0.15	5
6	6.00	0.10	6.00	0.13	6.00	0.16	6 00	0.18	6
7	7.00	0.12	7.00	0.15	7.00	0.18	7.00	0.21	7
8	8.00	0.14	8.00	0.17	8.00	0.21	8 00	0.24	8
9	9.00	0.16	9.00	0.20	9.00	0.24	9.00	0.27	9
10	10 00	0.17	10 00	0.22	10.00	0.26	10.00	0 31	10
11	11.00	0.19	11.00	0.24	11.00	0.29	10.99	0.34	11
12	12.00	0.21	12.00	0.26	12.00	0.31	11.99	0.37	12
13	13.00	0.23	13.00	0.28	13.00	0.34	12.99	0.40	13
14	14.00	0.24	14.00	0.31	14.00	0.37	13.99	0.43	14
15	15.00	0.26	15.00	0.33	15.00	0.39	14.99	0.46	15
16	16.00	0.28	16.00	0.35	15.99	0.42	15.99	0.49	16
17	17.00	0.30	17.00	0.37	16.99	0.45	16.99	0.52	17
18	18 00	0.31	18.00	0.39	17.99	0.47	17.99	0.55	18
19	19 00	0.33	19.00	0.41	18.99	0.50	18.99	0.58	19
20	20.00	0.35	20.00	0.44	19.99	0.52	19.99	0.61	20
21	21.00	0.37	21.00	0.46	20.99	0.55	20 99	0.64	21
22	22.00	0.38	21.99	0.48	21.99	0.58	21.99	0.67	22
23	23.00	0.40	22.99	0.50	22.99	0.60	22.99	0.70	23
24	24.00	0.42	23.99	0.52	23.99	0.63	23.99	0.73	24
25	25.00	0.44	24.99	0.55	24.99	0.65	24.99	0.76	25
26	26.00	0.45	25.99	0.57	25.99	0.68	35.99	0.79	26
27	27.00	0.47	26.99	0.59	26.99	0.71	26.99	0.82	27
28	28.00	0.49	27.99	0.61	27.99	0.73	27.99	0.86	28
29	29.00	0.51	28 99	0.64	28.99	0.76	28.99	0.89	29
30	30.00	0.52	29.99	0.65	29.99	0.79	29.99	0.92	30
31	31 00	0.54	30.99	0.68	30.99	0.81	30.99	0.95	31
32	32.00	0.56	31.99	0.70	31.99	0.84	31 99	0.98	32
33	33.00	0.58	32.99	0.72	32.99	0.86	32.98	1.01	33
34	33.99	0.59	33.99	0.74	33.99	0,89	33.98	1.04	34
35	34.99	0.61	34.99	0.76	34.99	0.92	34.98	1.07	35
36	35.99	0.63	35.99	0.79	35.99	0.94	35.98	1.10	36
37	36.99	0.65	36.99	0.81	36.99	0 97	36.98	1.13	37
38	37.99	0.66	37.99	0.83	37.99	0.99	37.98	1.16	38
39	38.99	0.68	38.99	0.85	38.99	1.02	38.98	1.19	39
40	39.99	0.70	39 99	0 87	39.99	1.05	39.98	1.22	40
41	40.99	0.72	40.99	0.89	40.99	1.07	40.98	1.25	41
42	41.99	0.73	41.99	0.92	41.99	1.10	41.98	1.28	42
43	42.99	0.75	42.99	0.94	42.99	1.13	42.98	1.31	43
44	43.99	0.77	43.99	0.96	43.99	1.15	43.98	1.34	44
45	44.99	0.79	44.99	0.98	44.98	1.18	44.98	1 37	45
46	45.99	0.80	45.99	1.00	45.98	1.20	45.98	1.40	46
47	46.99	0.82	46.99	1.03	46.98	1.23	46.98	1.44	47
48	47.99	0.84	47.99	1.05	47.98	1.26	47 98	1.47	48
49	48.99	0.86	48.99	1.07	48.98	1.28	48 98	1.50	49
50	49.99	0.87	49.99	1.09	49.98	1.31	49.98	1.53	50
51	50.99	0.89	50.99	1.11	50.98	1.34	50.98	1.56	51
52	51.99	0.91	51.99	1.14	51.98	1.36	51.98	1.59	52
53	52.99	0.93	52.99	1.16	52.98	1.39	52.98	1.62	53
54	53.99	0.94	53.99	1.18	53.98	1.41	53.98	1.65	54
55	54.99	0.96	54.99	1.20	54.98	1 44	54 98	1.68	55
56	55.99	0.98	55.99	1.22	55.98	1.47	55.98	1.71	56
57	56.99	1.00	56.99	1.24	56.98	1.49	56.97	1.74	57
58	57.99	1.01	57.99	1.27	57.98	1.52	57.97	1.77	58
59	58.99	1.03	58.99	1.29	58.98	1.54	58.97	1.80	59
60	59.99	1.05	59.99	1.31	59.98	1 57	59.97	1.83	60
61	60.99	1.06	60.98	1.33	60.98	1.60	60.97	1.86	61
62	61.99	1.08	61.98	1.35	61.98	1.62	61.97	1.89	62
63	62.99	1.10	62.98	1.38	62.98	1.65	62.97	1.92	63
64	63.99	1.12	63.98	1.40	63 98	1.67	63.97	1 95	64
65	64.99	1.13	64.98	1.42	64.98	1.70	64.97	1.99	65
66	65.99	1.15	65.98	1.44	65.98	1.73	65.97	2.02	66
67	66.99	1.17	66.98	1.46	66.98	1.75	66.97	2.05	67
68	67.99	1.19	67.98	1.48	67.98	1.78	67.97	2.08	68
69	68.99	1.20	68.98	1.51	68.98	1.81	68.97	2.11	69
70	69.99	1.22	69.98	1 53	69.98	1.83	69.97	2.14	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	89° 00′		88° 45′		88° 30′		88° 15		

Dist.	2°	0′	2°	15′	2°	30′	2°	45′	Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1.00	0,03	1.00	0.04	1.00	0.04	1.00	0:05	1
2	2.00	0.07	2.00	0.08	2.00	0.09	2.00	0.10	2
3	3.00	0.10	3.00	0.12	3.00	0.13	3.00	0.14	3
4	4.00	0.14	4.00	0.16	4.00	0.17	4.00	0.19	4
5	5.00	0.17	5.00	0.20	5.00	0.22	4.99	0.24	5
6	6.00	0.21	6.00	0.24	5.99	0.26	5.99	0.29	6
7	7.00	0.24	6.99	0.27	6.99	0.31	6.99	0.34	7
8	7.99	0.28	7.99	0.31	7.99	0.35	7.99	0.38	8
9	8.99	0.31	8.99	0.35	8.99	0.39	8.99	0:43	9
10	9.99	0 35	9,99	0.39	9.99	0.44	9.99	0.48	10
11	10,99	0.38	10.99	0.43	10.99	0.48	10.99	0.53	11
12	11.99	0.42	11.99	0.47	11.99	0.52	11.99	0.58	12
13	12.99	0.45	12.99	0.51	12.99	0.57	12.99	0.62	13
14	13.99	0.49	13.99	0.55	13.99	0.61	13.98	0.67	14
15	14.99	0.52	14.99	0.59	14.99	0.65	14.98	0.72	15
16	15.99	0.56	15.99	0 63	15.98	0.70	15.98	0.77	16
17	16.99	0.59	16.99	0.67	16.98	0.74	16.98	0.82	17
18	17 99	0.63	17.99	0.71	17.98	0.79	17.98	0.86	18
19	18.99	0.66	18.99	0.75	18 98	0.83	18.98	0.91	19
20	19.99	0.70	19.98	0.79	19.98	0.87	19.98	0.96	20
21	20.99	0.73	20.98	0.82	20.98	0.92	20.98	1.01	21
22	21.99	0.77	21.98	0·86	21.98	0.96	21.97	1.06	22
23	22.99	0.80	22.98	0.90	22.98	1.00	22.97	1.10	23
24	23.99	0.84	23.98	0.94	23.98	1.05	23.97	1.15	24
25	24.98	0.87	24.98	0.98	24.98	1.09	24.97	1.20	25
26	25.98	0.91	25 98	1.02	25.98	1.13	25.97	1.25	26
27	26.98	0.94	26.98	1.06	26.97	1.18	26.97	1.30	27
28	27.98	0.98	27.98	1.10	27.97	1.22	27.97	1.34	28
29	28.98	1.01	28.98	1.14	28 97	1.27	28.97	1.39	29
30	29.98	1,05	29.98	1.18	29.97	1.31	29.97	1.44	30
31	30.98	1.08	30.98	1.22	30.97	1.35	30.96	1.49	31
32	31.98	1.12	31.98	1.26	31.97	1.40	31.96	1.54	32
33	32.98	1.15	32.97	1.30	32.97	1.44	32.96	1.58	33
34	33.98	1.19	33.97	1.33	33.97	1.48	33.96	1.63	34
35	34.98	1.22	34.97	1 37	34.97	1.53	34.96	1.68	35
36	35.98	1.26	35.97	1.41	35.97	1.57	35.96	1.73	36
37	36.98	1.29	36,97	1 45	36.96	1.61	36.96	1.78	37
38	37.98	1.33	37.97	1.49	37.96	1.66	37.96	1.82	38
39	38.98	1.36	38.97	1.53	38.96	1.70	38.96	1.87	39
40	39.98	1.40	39.97	1.57	39.96	1.74	39.95	1.92	40
41	40.98	1.43	40.97	1.61	40.96	1.79	40.95	1.97	41
42	41,97	1.47	41.97	1.65	41.96	1.83	41.95	2.02	42
43	42.97	1.50	42.97	1.69	42.96	1.88	42.95	2.06	43
44	43.97	1.54	43.97	1.73	43.96	1.92	43 95	2.11	44
45	44.97	1.57	44.97	1.77	44.96	1.96	44.95	2.16	45
46	45 97	1.61	45.96	1.81	45.96	2.01	45.95	2.21	46
47	46.97	1.64	46.96	1.85	46.96	2.05	46.95	2.26	47
48	47.97	1.68	47.96	1.88	47.95	2.09	47.94	2.30	48
49	48.97	1.71	48.96	1.92	48.95	2.14	48.94	2.35	49
50	49 97	1.75	49 96	1.96	49.95	2.18	49.94	2.40	50
51	50,97	1.78	50.96	2.00	50.95	2.23	50.94	2.45	51
52	51.97	1.82	51.96	2.04	51.95	2.27	51.94	2.50	52
53	52.97	1.85	52.96	2.08	52.95	2.31	52.94	2.54	53
54	53.97	1.89	53.96	2.12	53.95	2.36	53.94	2.59	54
55	54.97	1.92	54.96	2.16	54.95	2.40	54.94	2.64	55
56	55.97	1.95	55.96	2.20	55.95	2.44	55.94	2.69	56
57	56.97	1.99	56.96	2.24	56.95	2,49	56 93	2.74	57
58	57.97	2.02	57.96	2.28	57.95	2.53	57.93	2.78	58
59	58.96	2.06	58 96	2.32	58.94	2.57	58.93	2.83	59
60	59.96	2-09	59.95	2.36	59.94	2.62	59.93	2.88	60
61	60.96	2.13	60.95	2.40	60.94	2.66	60.93	2.93	61
62	61,96	2.16	61.95	2.43	61.94	2.70	61.93	2.98	62
63	62.96	2.20	62.95	2.47	62.94	2.75	62.93	3.02	63
64	63.96	2.23	63.95	2.51	63.94	2.79	63.93	3.07	64
65	64.96	2.27	64.95	2.55	64 94	2.84	64.93	3.12	65
66	65.96	2:30	65.95	2.59	65.94	2.88	65.92	3.17	66
67	66.96	2.34	66.95	2.63	66 94	2.92	66.92	3.22	67
68	67.96	2.37	67.95	2.67	67.94	2.97	67.92	3.26	68
69	68.96	2.41	68.95	2.71	68.94	3.01	68.92	3.31	69
70	69.96	2.44	69.95	2.75	69.93	3.05	69.92	3.36	70
Dist.	Dep.	Lat.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Dist.
	88°	0′	87°	45′	87°	30′	87°	15′	

Dist.	3° '0'		3° 15'		3° 30'		°3 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1.00	0.05	1.00	0.06	1.00	0.06	1.00	0.07	1
2	2.00	0.10	2.00	0.11	2.00	0.12	2.00	0.13	2
3	3.00	0.16	3.00	0.17	2.99	0.18	2.99	0.20	3
4	3.99	0.21	3.99	0.23	3.99	0.24	3.99	0.26	4
5	4.99	0.26	4.99	0.28	4.99	0.31	4.99	0.33	5
6	5.99	0.31	5.99	0.34	5.99	0.37	5.99	0.39	6
7	6.99	0.37	6.99	0.40	6.99	0.43	6.99	0.46	7
8	7.99	0.42	7.99	0.45	7.99	0.49	7.98	0.52	8
9	8.99	0.47	8.99	0.51	8.98	0.55	8.98	0.59	9
10	9.99	0.52	9.98	0.57	9.98	0.61	9.98	0.65	10
11	10.98	0.58	10.98	0.62	10.98	0.67	10.98	0.72	11
12	11.98	0.63	11.98	0.68	11.98	0.73	11.97	0.78	12
13	12.98	0.68	12.98	0.74	12.98	0.79	12.97	0.85	13
14	13.98	0.73	13.98	0.79	13.97	0.85	13.97	0.92	14
15	14.98	0.79	14.98	0.85	14.97	0.92	14.97	0.98	15
16	15.98	0.84	15.97	0.91	15.97	0.98	15.97	1.05	16
17	16.98	0.89	16.97	0.96	16.97	1.04	16.96	1.11	17
18	17.98	0.94	17.97	1.02	17.97	1.10	17.96	1.18	18
19	18.97	0.99	18.97	1.08	18.96	1.16	18.96	1.24	19
20	19.97	1.05	19.97	1.13	19.96	1.22	19.96	1.31	20
21	20.97	1.10	20.97	1.19	20.96	1.28	20.96	1.37	21
22	21.97	1.15	21.96	1.25	21.96	1.34	21.95	1.44	22
23	22.97	1.20	22.96	1.30	22.96	1.40	22.95	1.50	23
24	23.97	1.26	23.96	1.36	23.96	1.47	23.95	1.57	24
25	24.97	1.31	24.96	1.42	24.95	1.53	24.95	1.64	25
26	25.96	1.36	25.96	1.47	25.95	1.59	25.94	1.70	26
27	26.96	1.41	26.96	1.53	26.95	1.65	26.94	1.77	27
28	27.96	1.47	27.95	1.59	27.95	1.71	27.94	1.83	28
29	28.96	1.52	28.95	1.64	28.95	1.77	28.94	1.90	29
30	29.96	1.57	29.95	1.70	29.94	1.83	29.94	1.96	30
31	30.96	1.62	30.95	1.76	30.94	1.89	30.93	2.03	31
32	31.96	1.67	31.95	1.81	31.94	1.95	31.93	2.10	32
33	32.95	1.73	32.95	1.87	32.94	2.01	32.93	2.16	33
34	33.95	1.78	33.95	1.93	33.94	2.08	33.93	2.22	34
35	34.95	1.83	34.94	1.98	34.93	2.14	34.93	2.29	35
36	35.95	1.88	35.94	2.04	35.93	2.20	35.92	2.35	36
37	36.95	1.94	36.94	2.10	36.93	2.26	36.92	2.42	37
38	37.95	1.99	37.94	2.15	37.93	2.32	37.92	2.49	38
39	38.95	2.04	38.94	2.21	38.93	2.38	38.92	2.55	39
40	39.95	2.09	39.94	2.27	39.93	2.44	39.91	2.62	40
41	40.94	2.15	40.93	2.32	40.92	2.50	40.91	2.68	41
42	41.94	2.20	41.93	2.38	41.92	2.56	41.91	2.75	42
43	42.94	2.25	42.93	2.44	42.92	2.63	42.91	2.81	43
44	43.94	2.30	43.93	2.49	43.92	2.69	43.91	2.88	44
45	44.94	2.36	44.93	2.55	44.92	2.75	44.90	2.94	45
46	45.94	2.41	45.93	2.61	45.91	2.81	45.90	3.01	46
47	46.94	2.46	46.92	2.66	46.91	2.87	46.90	3.07	47
48	47.93	2.51	47.92	2.72	47.91	2.93	47.90	3.14	48
49	48.93	2.56	48.92	2.78	48.91	2.99	48.90	3.20	49
50	49.93	2.62	49.92	2.83	49.91	3.05	49.89	3.27	50
51	50.93	2.67	50.92	2.89	50.90	3.11	50.89	3.34	51
52	51.93	2.72	51.92	2.95	51.90	3.18	51.89	3.40	52
53	52.93	2.77	52.92	3.01	52.90	3.24	52.89	3.47	53
54	53.93	2.83	53.91	3.06	53.90	3.30	53.88	3.53	54
55	54.92	2.88	54.91	3.12	54.90	3.36	54.88	3.60	55
56	55.92	2.93	55.91	3.18	55.90	3.42	55.88	3.66	56
57	56.92	2.98	56.91	3.23	56.89	3.48	56.88	3.73	57
58	57.92	3.04	57.91	3.29	57.89	3.54	57.88	3.79	58
59	58.92	3.09	58.91	3.35	58.89	3.60	58.87	3.85	59
60	59.92	3.14	59.90	3.40	59.89	3.66	59.87	3.92	60
61	60.92	3.19	60.90	3.46	60.89	3.72	60.87	3.99	61
62	61.92	3.24	61.90	3.51	61.88	3.79	61.87	4.06	62
63	62.92	3.30	62.90	3.57	62.88	3.85	62.87	4.12	63
64	63.91	3.35	63.90	3.63	63.88	3.91	63.86	4.19	64
65	64.91	3.40	64.90	3.69	64.88	3.97	64.86	4.25	65
66	65.91	3.45	65.89	3.74	65.88	4.03	65.86	4.32	66
67	66.91	3.51	66.89	3.80	66.88	4.09	66.86	4.38	67
68	67.91	3.56	67.89	3.86	67.87	4.16	67.86	4.45	68
69	68.91	3.61	68.89	3.91	68.87	4.22	68.85	4.51	69
70	69.91	3.66	69.89	3.97	69.87	4.28	69.85	4.58	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	87°	0'	86°	45'	86°	30'	86°	15'	

Dist.	4° .0′		4° 15′		4° 30′		4° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1.00	0.07	1.00	0.07	1.00	0.08	1.00	0.08	1
2	2.00	0.14	1.99	0.15	1.99	0.16	1.99	0.17	2
3	2.99	0.21	2.99	0.22	2.99	0.24	2.99	0.25	3
4	3.99	0.28	3.99	0.30	3.99	0.31	3.99	0.33	4
5	4.99	0.35	4.99	0.37	4.98	0.39	4.98	0.41	5
6	5.99	0.42	5.98	0.44	5.98	0.47	5.98	0.50	6
7	6.98	0.49	6.98	0.52	6.98	0.55	6.98	0.58	7
8	7.98	0.56	7.98	0.59	7.98	0.63	7.97	0.66	8
9	8.98	0.63	8.98	0.67	8.97	0.71	8.97	0.75	9
10	9.98	0.70	9.97	0.74	9.97	0.78	9.97	0.83	10
11	10.97	0.77	10.97	0.82	10.97	0.86	10.96	0.91	11
12	11.97	0.84	11.97	0.89	11.96	0.94	11.96	0.99	12
13	12.97	0.91	12.96	0.96	12.96	1.02	12.96	1.08	13
14	13.97	0.98	13.96	1.04	13.96	1.10	13.95	1.16	14
15	14.96	1.05	14.96	1.11	14.95	1.18	14.95	1.24	15
16	15.96	1.12	15.96	1.19	15.95	1.26	15.95	1.33	16
17	16.96	1.19	16.95	1.26	16.95	1.33	16.94	1.41	17
18	17.96	1.26	17.95	1.33	17.94	1.41	17.94	1.49	18
19	18.95	1.33	18.95	1.41	18.94	1.49	18.93	1.57	19
20	19.95	1.40	19.95	1.48	19.94	1.57	19.93	1.66	20
21	20.95	1.47	20.94	1.56	20.94	1.65	20.93	1.74	21
22	21.95	1.53	21.94	1.63	21.93	1.73	21.92	1.82	22
23	22.94	1.60	22.94	1.70	22.93	1.80	22.92	1.90	23
24	23.94	1.67	23.93	1.78	23.93	1.88	23.92	1.99	24
25	24.94	1.74	24.93	1.85	24.92	1.96	24.91	2.07	25
26	25.94	1.81	25.93	1.93	25.92	2.04	25.91	2.15	26
27	26.93	1.88	26.93	2.00	26.92	2.12	26.91	2.24	27
28	27.93	1.95	27.92	2.08	27.91	2.20	27.90	2.32	28
29	28.93	2.02	28.92	2.15	28.91	2.28	28.90	2.40	29
30	29.93	2.09	29.92	2.22	29.91	2.35	29.90	2.48	30
31	30.92	2.16	30.91	2.30	30.90	2.43	30.89	2.57	31
32	31.92	2.23	31.91	2.37	31.90	2.51	31.89	2.65	32
33	32.92	2.30	32.91	2.45	32.90	2.59	32.89	2.73	33
34	33.92	2.37	33.91	2.52	33.90	2.67	33.88	2.82	34
35	34.91	2.44	34.90	2.59	34.89	2.75	34.88	2.90	35
36	35.91	2.51	35.90	2.67	35.89	2.82	35.88	2.98	36
37	36.91	2.58	36.90	2.74	36.89	2.90	36.87	3.06	37
38	37.91	2.65	37.90	2.82	37.88	2.98	37.87	3.15	38
39	38.90	2.72	38.89	2.89	38.88	3.06	38.87	3.23	39
40	39.90	2.79	39.89	2.96	39.88	3.14	39.86	3.31	40
41	40.90	2.86	40.89	3.04	40.87	3.22	40.86	3.40	41
42	41.90	2.93	41.88	3.11	41.87	3.30	41.86	3.48	42
43	42.90	3.00	42.88	3.19	42.87	3.37	42.85	3.56	43
44	43.89	3.07	43.88	3.26	43.86	3.45	43.85	3.64	44
45	44.89	3.14	44.88	3.34	44.86	3.53	44.85	3.73	45
46	45.89	3.21	45.87	3.41	45.86	3.61	45.84	3.81	46
47	46.89	3.28	46.87	3.48	46.86	3.69	46.84	3.89	47
48	47.88	3.35	47.87	3.56	47.85	3.77	47.84	3.97	48
49	48.88	3.42	48.87	3.63	48.85	3.84	48.83	4.06	49
50	49.88	3.49	49.86	3.71	49.85	3.92	49.83	4.14	50
51	50.88	3.56	50.86	3.78	50.84	4.00	50.83	4.22	51
52	51.87	3.63	51.86	3.85	51.84	4.08	51.82	4.31	52
53	52.87	3.70	52.86	3.93	52.84	4.16	52.82	4.39	53
54	53.87	3.77	53.85	4.00	53.83	4.24	53.82	4.47	54
55	54.87	3.84	54.85	4.08	54.83	4.32	54.81	4.56	55
56	55.86	3.91	55.85	4.15	55.83	4.39	55.81	4.64	56
57	56.86	3.98	56.84	4.23	56.82	4.47	56.81	4.72	57
58	57.86	4.05	57.84	4.30	57.82	4.55	57.80	4.80	58
59	58.86	4.12	58.84	4.37	58.82	4.63	58.80	4.89	59
60	59.85	4.19	59.84	4.45	59.82	4.71	59.79	4.97	60
61	60.85	4.26	60.83	4.52	60.81	4.79	60.79	5.05	61
62	61.85	4.33	61.83	4.60	61.81	4.86	61.79	5.13	62
63	62.85	4.40	62.83	4.67	62.81	4.94	62.78	5.22	63
64	63.84	4.47	63.82	4.74	63.80	5.02	63.78	5.30	64
65	64.84	4.54	64.82	4.81	64.80	5.10	64.78	5.38	65
66	65.84	4.61	65.82	4.89	65.80	5.18	65.77	5.47	66
67	66.84	4.67	66.82	4.97	66.79	5.26	66.77	5.55	67
68	67.83	4.74	67.81	5.04	67.79	5.34	67.77	5.63	68
69	68.83	4.81	68.81	5.11	68.79	5.41	68.76	5.71	69
70	69.83	4.88	69.81	5.19	69.78	5.49	69.76	5.80	70
Dist.	Dep	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dist.
	87° 00′		86° 45′		86° 30′		86° 15′		

Dist.	5° 0'		5° 15'		5° 30'		5° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	1.00	0.09	1.00	0.09	1.00	0.10	1.00	0.10	1
2	1.99	0.17	1.99	0.18	1.99	0.19	1.99	0.20	2
3	2.99	0.26	2.99	0.27	2.99	0.29	2.98	0.30	3
4	3.98	0.35	3.98	0.37	3.98	0.38	3.98	0.40	4
5	4.98	0.44	4.98	0.46	4.98	0.48	4.97	0.50	5
6	5.98	0.52	5.97	0.55	5.97	0.58	5.97	0.60	6
7	6.97	0.61	6.97	0.64	6.97	0.67	6.96	0.70	7
8	7.97	0.70	7.97	0.73	7.96	0.77	7.96	0.80	8
9	8.97	0.78	8.96	0.82	8.96	0.86	8.95	0.90	9
10	9.96	0.87	9.96	0.92	9.95	0.96	9.95	1.00	10
11	10.96	0.96	10.95	1.01	10.95	1.05	10.94	1.10	11
12	11.95	1.05	11.95	1.10	11.94	1.15	11.94	1.20	12
13	12.95	1.13	12.95	1.19	12.94	1.25	12.93	1.30	13
14	13.95	1.22	13.94	1.28	13.94	1.34	13.93	1.40	14
15	14.94	1.31	14.94	1.37	14.93	1.44	14.92	1.50	15
16	15.94	1.39	15.93	1.46	15.93	1.53	15.92	1.60	16
17	16.94	1.48	16.93	1.56	16.92	1.63	16.91	1.70	17
18	17.93	1.57	17.92	1.65	17.92	1.73	17.91	1.80	18
19	18.93	1.66	18.92	1.74	18.91	1.82	18.90	1.90	19
20	19.92	1.74	19.92	1.83	19.91	1.92	19.90	2.00	20
21	20.92	1.83	20.91	1.92	20.90	2.01	20.89	2.10	21
22	21.92	1.92	21.91	2.01	21.90	2.11	21.89	2.20	22
23	22.91	2.00	22.90	2.10	22.89	2.20	22.88	2.30	23
24	23.91	2.09	23.90	2.20	23.89	2.30	23.88	2.40	24
25	24.90	2.18	24.90	2.29	24.89	2.40	24.87	2.50	25
26	25.90	2.27	25.89	2.38	25.88	2.49	25.87	2.60	26
27	26.90	2.35	26.89	2.47	26.88	2.59	26.86	2.71	27
28	27.89	2.44	27.88	2.56	27.87	2.68	27.86	2.81	28
29	28.89	2.53	28.88	2.65	28.87	2.78	28.85	2.91	29
30	29.89	2.61	29.87	2.75	29.86	2.88	29.85	3.01	30
31	30.88	2.70	30.87	2.84	30.86	2.97	30.84	3.11	31
32	31.88	2.79	31.37	2.93	31.85	3.07	31.84	3.21	32
33	32.87	2.88	32.86	3.02	32.85	3.16	32.83	3.31	33
34	33.87	2.96	33.86	3.11	33.84	3.26	33.83	3.41	34
35	34.87	3.05	34.85	3.20	34.84	3.35	34.82	3.51	35
36	35.86	3.14	35.85	3.29	35.83	3.45	35.82	3.61	36
37	36.86	3.22	36.84	3.39	36.83	3.55	36.81	3.71	37
38	37.86	3.31	37.84	3.48	37.83	3.64	37.81	3.81	38
39	38.85	3.40	38.84	3.57	38.82	3.74	38.80	3.91	39
40	39.85	3.49	39.83	3.66	39.82	3.83	39.80	4.01	40
41	40.84	3.57	40.83	3.75	40.81	3.93	40.79	4.11	41
42	41.84	3.66	41.82	3.84	41.81	4.03	41.79	4.21	42
43	42.84	3.75	42.82	3.93	42.80	4.12	42.78	4.31	43
44	43.83	3.84	43.82	4.03	43.80	4.22	43.78	4.41	44
45	44.83	3.92	44.81	4.12	44.79	4.31	44.77	4.51	45
46	45.82	4.01	45.81	4.21	45.79	4.41	45.77	4.61	46
47	46.82	4.10	46.80	4.30	46.78	4.51	46.76	4.71	47
48	47.82	4.18	47.80	4.39	47.78	4.60	47.76	4.81	48
49	48.81	4.27	48.79	4.48	48.77	4.70	48.75	4.91	49
50	49.81	4.36	49.79	4.58	49.77	4.79	49.75	5.01	50
51	50.81	4.45	50.79	4.67	50.77	4.89	50.74	5.11	51
52	51.80	4.53	51.78	4.76	51.76	4.99	51.74	5.21	52
53	52.80	4.62	52.78	4.85	52.76	5.08	52.73	5.31	53
54	53.80	4.71	53.77	4.94	53.75	5.18	53.73	5.41	54
55	54.79	4.79	54.77	5.03	54.75	5.27	54.72	5.51	55
56	55.79	4.88	55.77	5.12	55.74	5.37	55.72	5.61	56
57	56.78	4.97	56.76	5.22	56.74	5.46	56.71	5.71	57
58	57.78	5.06	57.76	5.31	57.73	5.56	57.71	5.81	58
59	58.78	5.15	58.75	5.40	58.73	5.66	58.70	5.91	59
60	59.77	5.23	59.75	5.49	59.72	5.75	59.70	6.01	60
61	60.77	5.32	60.74	5.58	60.72	5.85	60.69	6.11	61
62	61.76	5.40	61.74	5.67	61.72	5.94	61.69	6.21	62
63	62.76	5.49	62.74	5.77	62.71	6.04	62.68	6.31	63
64	63.76	5.58	63.73	5.86	63.71	6.13	63.68	6.41	64
65	64.75	5.67	64.73	5.95	64.70	6.23	64.67	6.51	65
66	65.75	5.75	65.72	6.04	65.70	6.33	65.67	6.61	66
67	66.74	5.84	66.72	6.13	66.69	6.42	66.66	6.71	67
68	67.74	5.93	67.71	6.22	67.69	6.52	67.66	6.81	68
69	68.74	6.02	68.71	6.31	68.68	6.61	68.65	6.91	69
70	69.73	6.10	69.71	6.41	69.68	6.71	69.65	7.01	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	85° 0'		84° 45'		84° 30'		84° 15'		

Dist.	6° 0′		6° 15′		6° 30′		6° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.99	0.10	0.99	0.11	0.99	0.11	0.99	0.12	1
2	1.99	0.21	1.99	0.22	1.99	0.23	1.99	0.24	2
3	2.98	0.31	2.98	0.33	2.98	0.34	2.98	0.35	3
4	3.98	0.42	3.98	0.44	3.97	0.45	3.97	0.47	4
5	4.97	0.52	4.97	0.54	4.97	0.57	4.97	0.59	5
6	5.97	0.63	5.96	0.65	5.96	0.68	5.96	0.71	6
7	6.96	0.73	6.96	0.76	6.96	0.79	6.95	0.82	7
8	7.96	0.84	7.95	0.87	7.95	0.91	7.94	0.94	8
9	8.95	0.94	8.95	0.98	8.94	1.02	8.94	1.06	9
10	9.95	1.05	9.94	1.09	9.94	1.13	9.93	1.18	10
11	10.94	1.15	10.93	1.20	10.93	1.25	10,92	1.29	11
12	11.93	1.25	11.93	1.31	11.92	1.36	11.92	1.41	12
13	12.93	1.36	12.92	1.42	12.92	1.47	12.91	1.53	13
14	13.92	1.46	13.92	1.52	13.91	1.58	13.90	1·65	14
15	14.92	1.57	14.91	1.63	14.90	1.70	14.90	1.76	15
16	15.91	1.67	15.91	1.74	15.90	1.81	15.89	1.88	16
17	16.91	1.78	16.90	1.85	16.89	1.92	16.88	2.00	17
18	17.90	1.88	17.89	1.96	17.88	2.04	17.88	2.12	18
19	18.90	1.99	18.89	2.07	18.88	2.15	18.87	2.23	19
20	19.89	2.09	19.88	2.18	19·87	2.26	19.86	2.35	20
21	20.89	2.20	20.88	2.29	20.86	2.38	20.85	2.47	21
22	21.88	2.30	21.87	2.40	21.86	2.49	21.85	2.59	22
23	22.87	2.40	22.86	2.50	22.85	2.60	22.84	2.70	23
24	23,87	2.51	23.86	2.61	23.85	2·72	23.83	2.82	24
25	24.86	2.61	24.85	2.72	24.84	2.83	24.83	2.94	25
26	25.86	2.72	25.85	2.83	25.83	2.94	25.82	3.06	26
27	26.85	2.82	26.84	2.94	26.83	3.06	26.81	3.17	27
28	27.85	2.93	27.83	3.05	27.82	3,17	27.81	3.29	28
29	28.84	3.03	28.83	3.16	28.81	3.28	28.80	3.41	29
30	29.84	3.14	29.82	3.27	29.81	3.40	29.79	3.53	30
31	30.83	3.24	30.82	3.38	30.80	3.51	30.79	3.64	31
32	31.82	3.35	31.81	3.48	31.79	3.62	31.78	3.76	32
33	32.82	3.45	32.80	3.59	32.79	3.74	32.77	3.88	33
34	33.81	3.55	33.80	3.70	33.78	3.85	33.76	4.00	34
35	34.81	3.66	34.79	3.81	34.78	3.96	34.76	4.11	35
36	35.80	3.76	35.79	3.92	35.77	4.08	35.75	4.23	36
37	36.80	3.87	36.78	4.03	36.76	4.19	36.74	4.35	37
38	37.79	3.97	37.77	4.14	37.76	4·30	37.74	4.47	38
39	38.79	4.08	38.77	4.25	38.75	4.41	38.73	4.58	39
40	39.78	4.18	39.76	4.35	39.74	4.53	39.72	4.70	40
41	40.78	4.29	40.76	4.46	40.74	4.64	40.72	4·82	41
42	41.77	4.39	41.75	4.57	41.73	4.75	41.71	4.94	42
43	42.76	4.49	42.74	4.68	42.72	4.87	42.70	5.05	43
44	43·76	4.60	43.74	4.79	43.72	4.98	43.70	5.17	44
45	44.75	4.70	44.73	4.90	44.71	5.09	44.69	5.29	45
46	45.75	4.81	45.73	5.01	45.70	5.21	45.68	5.41	46
47	46.74	4.91	46.72	5.12	46.70	5.32	46.67	5.52	47
48	47.74	5.02	47.71	5.23	47.69	5.43	47.67	5.64	48
49	48.73	5.12	48.71	5.33	48.68	5.55	48.66	5·76	49
50	49.73	5.23	49.70	5.44	49.68	5.66	49.65	5.88	50
51	50.72	5.33	50.70	5.55	50.67	5.77	50.65	6.00	51
52	51.72	5.44	51.69	5.66	51.67	5.89	51.64	6.11	52
53	52.71	5.54	52.69	5.77	52·66	6.00	52.63	6.23	53
54	53.70	5.65	53.68	5.88	53.65	6.11	53.63	6.35	54
55	54.70	5.75	54.67	5.99	54.65	6.23	54.62	6.46	55
56	55.69	5.85	55.67	6.10	55.64	6.34	55.61	6.58	56
57	56.69	5.96	56.66	6.21	56.63	6.45	56.61	6.70	57
58	57.68	6.06	57.66	6.31	57.63	6.57	57.60	6.82	58
59	58.68	6.17	58.65	6.42	58.62	6.68	58.59	6.93	59
60	59.67	6.27	59.64	6.53	59.61	6.79	59.58	7.05	60
61	60.67	6.38	60·64	6.64	60.61	6.91	60.58	7.17	61
62	61.66	6.48	61.63	6.75	61.60	7.02	61.57	7.29	62
63	62.66	6.59	62.63	6.86	62.60	7.13	62.56	7.41	63
64	63.65	6.69	63.62	6.97	63.59	7.24	63.56	7.52	64
65	64.64	6.80	64.61	7.08	64.58	7.36	64.55	7.64	65
66	65.64	6.90	65.61	7.19	65.58	7.47	65.55	7.76	66
67	66.63	7.01	66.60	7.29	66.57	7.58	66.54	7.88	67
68	67.63	7.11	67.60	7.40	67.56	7.70	67.53	7.99	68
69	68.62	7.21	68.59	7.51	68.56	7.80	68.52	8.11	69
70	69.62	7.32	69.58	7.62	69.55	7.92	69.52	8.23	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	84° 0′		83° 45′		83° 30′		83° 15′		

Dist.	7° 0'		7° 15'		7° 30'		7° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.99	0.12	0.99	0.13	0.99	0.13	0.99	0.13	1
2	1.99	0.24	1.98	0.25	1.98	0.26	1.98	0.27	2
3	2.98	0.37	2.98	0.38	2.97	0.39	2.97	0.40	3
4	3.97	0.49	3.97	0.50	3.97	0.52	3.96	0.54	4
5	4.96	0.61	4.96	0.63	4.96	0.65	4.95	0.67	5
6	5.96	0.73	5.95	0.76	5.95	0.78	5.95	0.81	6
7	6.95	0.85	6.94	0.88	6.94	0.91	6.94	0.94	7
8	7.94	0.98	7.94	1.01	7.93	1.04	7.93	1.08	8
9	8.93	1.10	8.93	1.14	8.92	1.17	8.92	1.21	9
10	9.93	1.22	9.92	1.26	9.91	1.31	9.91	1.35	10
11	10.92	1.34	10.91	1.39	10.91	1.44	10.90	1.48	11
12	11.91	1.46	11.90	1.51	11.90	1.57	11.89	1.62	12
13	12.90	1.58	12.90	1.64	12.89	1.70	12.88	1.75	13
14	13.90	1.71	13.89	1.77	13.88	1.83	13.87	1.89	14
15	14.89	1.83	14.88	1.89	14.87	1.96	14.86	2.02	15
16	15.88	1.95	15.87	2.02	15.86	2.09	15.85	2.16	16
17	16.87	2.07	16.86	2.15	16.85	2.22	16.84	2.29	17
18	17.87	2.19	17.86	2.27	17.85	2.35	17.84	2.43	18
19	18.86	2.32	18.85	2.40	18.84	2.48	18.83	2.56	19
20	19.85	2.44	19.84	2.52	19.83	2.61	19.82	2.70	20
21	20.84	2.56	20.83	2.65	20.82	2.74	20.81	2.83	21
22	21.84	2.68	21.82	2.78	21.81	2.87	21.80	2.97	22
23	22.83	2.80	22.82	2.90	22.80	3.00	22.79	3.10	23
24	23.82	2.92	23.81	3.03	23.79	3.13	23.78	3.24	24
25	24.81	3.05	24.80	3.16	24.79	3.26	24.77	3.37	25
26	25.81	3.17	25.79	3.28	25.78	3.39	25.76	3.51	26
27	26.80	3.29	26.78	3.41	26.77	3.52	26.75	3.64	27
28	27.79	3.41	27.78	3.53	27.76	3.65	27.74	3.78	28
29	28.78	3.53	28.77	3.66	28.75	3.79	28.74	3.91	29
30	29.78	3.66	29.76	3.79	29.74	3.92	29.73	4.05	30
31	30.77	3.78	30.75	3.91	30.73	4.05	30.72	4.18	31
32	31.76	3.90	31.74	4.04	31.73	4.18	31.71	4.32	32
33	32.75	4.02	32.74	4.16	32.72	4.31	32.70	4.45	33
34	33.75	4.14	33.73	4.29	33.71	4.44	33.69	4.58	34
35	34.74	4.27	34.72	4.42	34.70	4.57	34.68	4.72	35
36	35.73	4.39	35.71	4.54	35.69	4.70	35.67	4.85	36
37	36.72	4.51	36.70	4.67	36.68	4.83	36.66	4.99	37
38	37.72	4.63	37.70	4.80	37.67	4.96	37.65	5.12	38
39	38.71	4.75	38.69	4.92	38.67	5.09	38.64	5.26	39
40	39.70	4.87	39.68	5.05	39.66	5.22	39.63	5.39	40
41	40.69	5.00	40.67	5.17	40.65	5.35	40.63	5.53	41
42	41.69	5.12	41.66	5.30	41.64	5.48	41.62	5.66	42
43	42.68	5.24	42.66	5.43	42.63	5.61	42.61	5.80	43
44	43.67	5.36	43.65	5.55	43.62	5.74	43.60	5.93	44
45	44.66	5.48	44.64	5.68	44.61	5.87	44.59	6.07	45
46	45.66	5.61	45.63	5.81	45.61	6.00	45.58	6.20	46
47	46.65	5.73	46.62	5.93	46.60	6.13	46.57	6.34	47
48	47.64	5.85	47.62	6.06	47.59	6.27	47.56	6.47	48
49	48.64	5.97	48.61	6.18	48.58	6.40	48.55	6.61	49
50	49.63	6.09	49.60	6.31	49.57	6.53	49.54	6.74	50
51	50.62	6.22	50.59	6.44	50.56	6.66	50.54	6.88	51
52	51.61	6.34	51.58	6.56	51.56	6.79	51.53	7.01	52
53	52.61	6.46	52.58	6.69	52.55	6.92	52.52	7.15	53
54	53.60	6.58	53.57	6.82	53.54	7.05	53.51	7.28	54
55	54.59	6.70	54.56	6.94	54.53	7.18	54.50	7.42	55
56	55.58	6.83	55.55	7.07	55.52	7.31	55.49	7.55	56
57	56.58	6.95	56.54	7.19	56.51	7.44	56.48	7.69	57
58	57.57	7.07	57.54	7.32	57.50	7.57	57.47	7.82	58
59	58.56	7.19	58.53	7.45	58.50	7.70	58.46	7.96	59
60	59.55	7.31	59.52	7.57	59.49	7.83	59.45	8.09	60
61	60.55	7.43	60.51	7.70	60.48	7.96	60.44	8.23	61
62	61.54	7.56	61.50	7.82	61.47	8.09	61.43	8.36	62
63	62.53	7.68	62.50	7.95	62.46	8.22	62.42	8.50	63
64	63.52	7.80	63.49	8.08	63.45	8.35	63.42	8.63	64
65	64.52	7.92	64.48	8.20	64.44	8.48	64.41	8.77	65
66	65.51	8.04	65.47	8.33	65.44	8.62	65.40	8.90	66
67	66.50	8.17	66.46	8.45	66.43	8.75	66.39	9.04	67
68	67.49	8.29	67.46	8.58	67.42	8.88	67.38	9.17	68
69	68.49	8.41	68.45	8.71	68.41	9.01	68.37	9.31	69
70	69.48	8.53	69.44	8.83	69.40	9.14	69.36	9.44	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	83° 0'		82° 45'		82° 30'		82° 15'		

Dist.	8° 0'		8° 15'		8° 30'		8° 45'		Dist.
	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	
1	0.99	0.14	0.99	0.14	0.99	0.15	0.99	0.15	1
2	1.98	0.28	1.98	0.29	1.98	0.30	1.98	0.30	2
3	2.97	0.42	2.97	0.43	2.97	0.44	2.97	0.46	3
4	3.96	0.56	3.96	0.57	3.96	0.59	3.95	0.61	4
5	4.95	0.70	4.95	0.72	4.95	0.74	4.94	0.76	5
6	5.94	0.84	5.94	0.86	5.93	0.89	5.93	0.91	6
7	6.93	0.97	6.93	1.00	6.92	1.03	6.92	1.06	7
8	7.92	1.11	7.92	1.15	7.91	1.18	7.91	1.22	8
9	8.91	1.25	8.91	1.29	8.90	1.33	8.90	1.37	9
10	9.90	1.39	9.90	1.43	9.89	1.48	9.88	1.52	10
11	10.89	1.53	10.89	1.58	10.88	1.63	10.87	1.67	11
12	11.88	1.67	11.88	1.72	11.87	1.77	11.86	1.83	12
13	12.87	1.81	12.87	1.87	12.86	1.92	12.85	1.98	13
14	13.86	1.95	13.86	2.01	13.85	2.07	13.84	2.13	14
15	14.85	2.09	14.84	2.15	14.84	2.22	14.83	2.28	15
16	15.84	2.23	15.83	2.30	15.82	2.36	15.81	2.43	16
17	16.83	2.37	16.82	2.44	16.81	2.51	16.80	2.59	17
18	17.82	2.51	17.81	2.58	17.80	2.66	17.79	2.74	18
19	18.82	2.64	18.80	2.73	18.79	2.81	18.78	2.89	19
20	19.81	2.78	19.79	2.87	19.78	2.96	19.77	3.04	20
21	20.80	2.92	20.78	3.01	20.77	3.10	20.76	3.19	21
22	21.79	3.06	21.77	3.16	21.76	3.25	21.74	3.35	22
23	22.78	3.20	22.76	3.30	22.75	3.40	22.73	3.50	23
24	23.77	3.34	23.75	3.44	23.74	3.55	23.72	3.65	24
25	24.76	3.48	24.74	3.59	24.73	3.70	24.71	3.80	25
26	25.75	3.62	25.73	3,73	25.71	3.84	25.70	3.96	26
27	26.74	3.76	26.72	3.87	26.70	3.99	26.69	4.11	27
28	27.73	3.90	27.71	4.02	27.69	4.14	27,67	4.26	28
29	28.72	4.04	28.70	4.16	28.68	4.29	28.66	4.41	29
30	29.71	4.18	29.69	4.30	29.67	4.43	29.65	4.56	30
31	30.70	4.31	30.68	4.45	30.66	4.58	30.64	4.72	31
32	31.69	4.45	31.67	4.59	31.65	4.73	31.63	4.87	32
33	32.68	4.59	32.66	4.74	32.64	4.88	32.62	5.02	33
34	33.67	4.73	33.65	4.88	33.63	5.03	33.60	5.17	34
35	34.66	4.87	34.64	5.02	34.62	5.17	34.59	5.32	35
36	35.65	5.01	35.63	5.17	35.60	5.32	35.58	5.48	36
37	36.64	5.15	36.62	5.31	36.59	5.47	36.57	5.63	37
38	37.63	5.29	37.61	5.45	37.58	5.62	37.56	5.78	38
39	38.62	5.43	38.60	5.60	38.57	5.76	38.55	5.93	39
40	39.61	5.57	39.59	5.74	39.56	5.91	39.53	6.08	40
41	40.60	5.71	40.58	5.88	40.55	6.06	40.52	6.24	41
42	41.59	5.85	41.57	6.03	41.54	6.21	41.51	6,39	42
43	42.58	5.98	42.56	6.17	42.53	6.36	42.50	6.54	43
44	43.57	6.12	43.54	6.31	43.52	6.50	43.49	6.69	44
45	44.56	6.26	44.53	6.46	44.51	6.65	44.48	6.85	45
46	45.55	6.40	45.52	6.60	45.49	6.80	45.46	7.00	46
47	46.54	6.54	46.51	6.74	46.48	6.95	46.45	7.15	47
48	47.53	6.68	47.50	6.89	47.47	7.09	47.44	7.30	48
49	48.52	6.82	48.49	7.03	48.46	7.24	48.43	7.45	49
50	49.51	6.96	49.48	7.17	49.45	7.39	49.42	7.61	50
51	50.50	7.10	50.47	7.32	50.44	7.54	50.41	7.76	51
52	51.49	7.24	51.46	7.46	51.43	7.69	51.40	7.91	52
53	52.48	7.38	52.45	7.61	52.42	7.83	52.38	8.06	53
54	53.47	7.52	53.44	7.75	53.41	7.98	53.37	8.21	54
55	54.47	7.66	54.43	7.89	54.40	8,13	54.36	8.37	55
56	55.46	7.79	55.42	8.04	55.39	8.28	55.35	8.52	56
57	56.45	7.93	56.41	8.18	56.37	8.43	56.34	8.67	57
58	57.44	8.07	57.40	8.32	57.36	8.57	57.33	8.82	58
59	58.43	8.21	58.39	8.47	58.35	8.72	58.31	8.98	59
60	59.42	8.35	59.38	8.61	59.34	8.87	59.30	9.13	60
61	60.41	8.49	60.37	8.75	60.33	9.02	60.29	9.28	61
62	61.40	8.63	61.36	8.90	61.32	9.16	61.28	9.43	62
63	62.39	8.77	62.35	9.04	62.31	9.31	62.27	9.58	63
64	63.38	8.91	63.34	9.18	63.30	9.46	63.26	9.74	64
65	64.37	9.05	64.33	9.33	64.29	9.61	64.24	9.89	65
66	65.36	9.19	65.32	9.47	65.28	9.76	65.23	10.04	66
67	66.35	9.32	66.31	9.61	66,26	9.90	66.22	10.19	67
68	67.34	9.46	67.30	9.76	67.25	10.05	67.21	10.34	68
69	68.33	9.60	68.29	9.90	68.24	10.20	68.20	10.50	69
70	69.32	9.74	69.28	10.04	69.23	10.35	69.19	10.65	70
Dist.	Dep.	Lat.	Dep	Lat.	Dep	Lat.	Dep.	Lat.	Dist.
	82° 0'		81° 45'		81° 30'		81° 15'		

Dist.	9° 0'		9° 15'		9° 30'		9° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.99	0.16	0.99	0.16	0.99	0.17	0.99	0.17	1
2	1.98	0.31	1.97	0.32	1.97	0.33	1.97	0.34	2
3	2.96	0.47	2.96	0.48	2.96	0.50	2.96	0.51	3
4	3.95	0.63	3.95	0.64	3.95	0.66	3.94	0.68	4
5	4.94	0.78	4.94	0.80	4.93	0.83	4.93	0.85	5
6	5.93	0.94	5.92	0.96	5.92	0.99	5.91	1.02	6
7	6.91	1.10	6.91	1.13	6.90	1.16	6.90	1.19	7
8	7.90	1.25	7.90	1.29	7.89	1.32	7.88	1.35	8
9	8.89	1.41	8.88	1.45	8.88	1.49	8.87	1.52	9
10	9.88	1.56	9.87	1.61	9.86	1.65	9.86	1.69	10
11	10.86	1.72	10.86	1.77	10.85	1.82	10.84	1.86	11
12	11.85	1.88	11.84	1.93	11.84	1.98	11.83	2.03	12
13	12.84	2.03	12.83	2.09	12.82	2.15	12.81	2.20	13
14	13.83	2.19	13.82	2.25	13.81	2.31	13.80	2.37	14
15	14.82	2.35	14.81	2.41	14.79	2.48	14.78	2.54	15
16	15.80	2.50	15.79	2.57	15.78	2.64	15.77	2.71	16
17	16.79	2.66	16.78	2.73	16.77	2.81	16.75	2.88	17
18	17.78	2.82	17.77	2.89	17.75	2.97	17.74	3.05	18
19	18.77	2.97	18.75	3.05	18.74	3.14	18.73	3.22	19
20	19.75	3.13	19.74	3.21	19.73	3.30	19.71	3.39	20
21	20.74	3.29	20.73	3.38	20.71	3.47	20.70	3.56	21
22	21.73	3.44	21.71	3.54	21.70	3.63	21.68	3.73	22
23	22.72	3.60	22.70	3.70	22.68	3.80	22.67	3.90	23
24	23.70	3.75	23.69	3.86	23.67	3.96	23.65	4.06	24
25	24.69	3.91	24.68	4.02	24.66	4.13	24.64	4.23	25
26	25.68	4.07	25.66	4.18	25.64	4.29	25.62	4.40	26
27	26.67	4.22	26.65	4.34	26.63	4.46	26.61	4.57	27
28	27.66	4.38	27.64	4.50	27.62	4.62	27.60	4.74	28
29	28.64	4.54	28.62	4.66	28.60	4.79	28.58	4.91	29
30	29.63	4.69	29.61	4.82	29.59	4.95	29.57	5.08	30
31	30.62	4.85	30.60	4.98	30.58	5.12	30.55	5.25	31
32	31.61	5.01	31.58	5.14	31.56	5.28	31.54	5.42	32
33	32.59	5.16	32.57	5.30	32.55	5.45	32.52	5.59	33
34	33.58	5.32	33.56	5.47	33.53	5.61	33.51	5.76	34
35	34.57	5.48	34.55	5.63	34.52	5.78	34.49	5.93	35
36	35.56	5.63	35.53	5.79	35.51	5.94	35.48	6.10	36
37	36.54	5.79	36.52	5.95	36.49	6.11	36.47	6.27	37
38	37.53	5.94	37.51	6.11	37.48	6.27	37.45	6.44	38
39	38.52	6.10	38.49	6.27	38.47	6.44	38.44	6.60	39
40	39.51	6.26	39.48	6.43	39.45	6.60	39.42	6.77	40
41	40.50	6.41	40.47	6.59	40.44	6.77	40.41	6.94	41
42	41.48	6.57	41.45	6.75	41.42	6.93	41.39	7.11	42
43	42.47	6.73	42.44	6.91	42.41	7.10	42.38	7.28	43
44	43.46	6.88	43.43	7.07	43.40	7.26	43.36	7.45	44
45	44.45	7.04	44.42	7.23	44.38	7.43	44.35	7.62	45
46	45.43	7.20	45.40	7.39	45.37	7.59	45.34	7.79	46
47	46.42	7.35	46.39	7.55	46.36	7.76	46.32	7.96	47
48	47.41	7.51	47.38	7.72	47.34	7.92	47.31	8.13	48
49	48.40	7.67	48.36	7.88	48.33	8.09	48.29	8.30	49
50	49.38	7.82	49.35	8.04	49.31	8.25	49.28	8.47	50
51	50.37	7.98	50.34	8.20	50.30	8.42	50.26	8.64	51
52	51.36	8.14	51.32	8.36	51.29	8.59	51.25	8.81	52
53	52.35	8.29	52.31	8.52	52.27	8.75	52.24	8.98	53
54	53.34	8.45	53.30	8.68	53.26	8.92	53.22	9.15	54
55	54.32	8.60	54.29	8.84	54.25	9.08	54.21	9.32	55
56	55.31	8.76	55.27	9.00	55.23	9.25	55.19	9.48	56
57	56.30	8.92	56.26	9.16	56.22	9.41	56.18	9.65	57
58	57.29	9.07	57.25	9.32	57.21	9.58	57.16	9.82	58
59	58.28	9.23	58.23	9.49	58.19	9.74	58.15	9.99	59
60	59.26	9.39	59.22	9.64	59.18	9.91	59.13	10.16	60
61	60.25	9.54	60.21	9.81	60.16	10.07	60.12	10.33	61
62	61.24	9.70	61.19	9.97	61.15	10.24	61.11	10.50	62
63	62.22	9.86	62.18	10.13	62.14	10.40	62.09	10.67	63
64	63.21	10.01	63.17	10.29	63.12	10.57	63.08	10.84	64
65	64.20	10.17	64.16	10.45	64.11	10.74	64.06	11.01	65
66	65.19	10.33	65.14	10.61	65.09	10.90	65.05	11.18	66
67	66.18	10.48	66.13	10.77	66.08	11.07	66.03	11.35	67
68	67.16	10.64	67.12	10.93	67.07	11.23	67.02	11.52	68
69	68.15	10.79	68.10	11.09	68.05	11.40	68.00	11.69	69
70	69.14	10.95	69.09	11.25	69.04	11.56	68.99	11.86	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	81° 0'		80° 45'		80° 30'		80° 15'		

Dist.	10° 0'		10° 15'		10° 30'		10° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.98	0.17	0.98	0.18	0.98	0.18	0.98	0.19	1
2	1.97	0.35	1.97	0.36	1.97	0.36	1.96	0.37	2
3	2.95	0.52	2.95	0.53	2.95	0.55	2.95	0.56	3
4	3.94	0.69	3.94	0.71	3.93	0.73	3.93	0.75	4
5	4.92	0.87	4.92	0.89	4.92	0.91	4.91	0.93	5
6	5.91	1.04	5.90	1.07	5.90	1.09	5.89	1.12	6
7	6.89	1.22	6.89	1.25	6.88	1.28	6.88	1.31	7
8	7.88	1.39	7.87	1.42	7.87	1.46	7.86	1.49	8
9	8.86	1.56	8.86	1.60	8.85	1.64	8.84	1.68	9
10	9.85	1.74	9.84	1.78	9.83	1.82	9.82	1.87	10
11	10.83	1.91	10.82	1.96	10.82	2.00	10.81	2.06	11
12	11.82	2.08	11.81	2.14	11.80	2.19	11.79	2.24	12
13	12.80	2.26	12.79	2.31	12.78	2.37	12.77	2.42	13
14	13.79	2.43	13.78	2.49	13.77	2.55	13.75	2.61	14
15	14.77	2.60	14.76	2.67	14.75	2.73	14.74	2.80	15
16	15.76	2.78	15.74	2.85	15.73	2.92	15.72	2.98	16
17	16.74	2.95	16.73	3.03	16.72	3.10	16.70	3.17	17
18	17.73	3.13	17.71	3.20	17.70	3.28	17.68	3.36	18
19	18.71	3.30	18.70	3.38	18.68	3.46	18.67	3.54	19
20	19.70	3.47	19.68	3.56	19.67	3.64	19.65	3.73	20
21	20.68	3.65	20.66	3.74	20.65	3.83	20.63	3.92	21
22	21.67	3.82	21.65	3.91	21.63	4.01	21.61	4.10	22
23	22.65	3.99	22.63	4.09	22.61	4.19	22.60	4.29	23
24	23.64	4.17	23.62	4.27	23.60	4.37	23.58	4.48	24
25	24.62	4.34	24.60	4.45	24.58	4.56	24.56	4.66	25
26	25.61	4.51	25.59	4.63	25.56	4.74	25.54	4.85	26
27	26.59	4.69	26.57	4.80	26.55	4.92	26.53	5.04	27
28	27.57	4.86	27.55	4.98	27.53	5.10	27.51	5.22	28
29	28.56	5.04	28.54	5.16	28.51	5.29	28.49	5.41	29
30	29.54	5.21	29.52	5.34	29.50	5.47	29.47	5.60	30
31	30.53	5.38	30.51	5.52	30.48	5.65	30.46	5.78	31
32	31.51	5.56	31.49	5.69	31.46	5.83	31.44	5.97	32
33	32.50	5.73	32.47	5.87	32.45	6.01	32.42	6.16	33
34	33.48	5.90	33.46	6.05	33.43	6.20	33.40	6.34	34
35	34.47	6.08	34.44	6.23	34.41	6.38	34.39	6.53	35
36	35.45	6.25	35.43	6.41	35.40	6.56	35.37	6.71	36
37	36.44	6.43	36.41	6.58	36.38	6.74	36.35	6.90	37
38	37.42	6.60	37.39	6.76	37.36	6.93	37.33	7.09	38
39	38.41	6.77	38.38	6.94	38.35	7.11	38.32	7.27	39
40	39.39	6.95	39.36	7.12	39.33	7.29	39.30	7.46	40
41	40.38	7.12	40.35	7.30	40.31	7.47	40.28	7.65	41
42	41.36	7.29	41.33	7.47	41.30	7.65	41.26	7.83	42
43	42.35	7.47	42.31	7.65	42.28	7.84	42.25	8.02	43
44	43.33	7.64	43.30	7.83	43.26	8.02	43.23	8.21	44
45	44.32	7.81	44.28	8.01	44.25	8.20	44.21	8.39	45
46	45.30	7.99	45.27	8.19	45.23	8.38	45.19	8.58	46
47	46.29	8.16	46.25	8.36	46.21	8.57	46.18	8.77	47
48	47.27	8.34	47.23	8.54	47.20	8.75	47.16	8.95	48
49	48.26	8.51	48.22	8.72	48.18	8.93	48.14	9.14	49
50	49.24	8.68	49.20	8.90	49.16	9.11	49.12	9.33	50
51	50.23	8.86	50.19	9.08	50.15	9.29	50.11	9.51	51
52	51.21	9.03	51.17	9.25	51.13	9.48	51.09	9.70	52
53	52.20	9.20	52.15	9.43	52.11	9.66	52.07	9.89	53
54	53.18	9.38	53.14	9.61	53.10	9.84	53.05	10.07	54
55	54.17	9.55	54.12	9.79	54.08	10.02	54.04	10.26	55
56	55.15	9.72	55.11	9.97	55.06	10.21	55.02	10.45	56
57	56.14	9.90	56.09	10.14	56.05	10.39	56.00	10.63	57
58	57.12	10.07	57.07	10.32	57.03	10.57	56.98	10.82	58
59	58.10	10.25	58.06	10.50	58.01	10.75	57.97	11.01	59
60	59.09	10.42	59.04	10.68	59.00	10.93	58.95	11.19	60
61	60.07	10.59	60.03	10.85	59.98	11.12	59.93	11.38	61
62	61.06	10.77	61.01	11.03	60.96	11.30	60.91	11.56	62
63	62.04	10.94	61.99	11.21	61.94	11.48	61.89	11.75	63
64	63.03	11.11	62.98	11.39	62.93	11.66	62.88	11.94	64
65	64.01	11.29	63.96	11.57	63.91	11.85	63.86	12.12	65
66	65.00	11.46	64.95	11.74	64.89	12.03	64.84	12.31	66
67	65.98	11.64	65.93	11.92	65.88	12.21	65.82	12.50	67
68	66.97	11.81	66.91	12.10	66.86	12.39	66.81	12.68	68
69	67.95	11.98	67.90	12.28	67.84	12.57	67.79	12.87	69
70	68.94	12.16	68.88	12.46	68.83	12.76	68.77	13.06	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	80° 0'		79° 45'		79° 30'		79° 15'		

Dist.	11° 0′		11° 15′		11° 30′		11° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.98	0.19	0.98	0.20	0.98	0.20	0.98	0.20	1
2	1.96	0.38	1.96	0.39	1.96	0.40	1.96	0.41	2
3	2.94	0.57	2.94	0.59	2.94	0.60	2.94	0.61	3
4	3.93	0.76	3.92	0.78	3.92	0.80	3.92	0 81	4
5	4.91	0.95	4.90	0.98	4.90	1.00	4.90	1.02	5
6	5.89	1.14	5.88	1.17	5.88	1.20	5.87	1.22	6
7	6 87	1.34	6.87	1.37	6.86	1.40	6.85	1.43	7
8	7.85	1.53	7.85	1.56	7.84	1.60	7.83	1.63	8
9	8.83	1.72	8.83	1.76	8.82	1.79	8.81	1.83	9
10	9.82	1.91	9 81	1.95	9.80	1.99	9.79	2.04	10
11	10.80	2.10	10.79	2.15	10.78	2,19	10.77	2.24	11
12	11.78	2.29	11.77	2.34	11.76	2.39	11.75	2.44	12
13	12.76	2 48	12.75	2.54	12.74	2.59	12.73	2.65	13
14	13.74	2.67	13.73	2.73	13.72	2.79	13.71	2.85	14
15	14.72	2.86	14.71	2.93	14,70	2.99	14.69	3.05	15
16	15.71	3.05	15.69	3.12	15.68	3.19	15.66	3.26	16
17	16.69	3.24	16.67	3.32	16.66	3.39	16.64	3.46	17
18	17.67	3.43	17.65	3.51	17.64	3.59	17.62	3.67	18
19	18.65	3.63	18.64	3.71	18.62	3.79	18.60	3.87	19
20	19.63	3.82	19.62	3.90	19.60	3.99	19.58	4.07	20
21	20.61	4.01	20 60	4.10	20.58	4.19	20.56	4.28	21
22	21.60	4.20	21.58	4.29	21.56	4.39	21.54	4.48	22
23	22.58	4.39	22.56	4.49	22.54	4.59	22.52	4 68	23
24	23.56	4.58	23.54	4.68	23.52	4.78	23.50	4.89	24
25	24.54	4.77	24.52	4.88	24.50	4.98	24.48	5.09	25
26	25.52	4.96	25.50	5 07	25.48	5.18	25.46	5.29	26
27	96.60	5.15	26.48	5.27	26.46	5.38	26 43	5.50	27
28	27.49	5.34	27.46	5.46	27.44	5.58	27 41	5.70	28
29	28.47	5.53	28.44	5 66	28.42	5.78	28 39	5.91	29
30	29.45	5.72	29.42	5.85	29.40	5.98	29.37	6.11	30
31	30.43	5.92	30.40	6.05	30.38	6.18	30.35	6.31	31
32	31.41	6.11	31.39	6.24	31.36	6.38	31.33	6.52	32
33	32.39	6.30	32.37	6.44	32.34	6.58	32.31	6.72	33
34	33.38	6.49	33.35	6.63	33.32	6.78	33.29	6.92	34
35	34.36	6.68	34.33	6.83	34.30	6.98	34.27	7.13	35
36	35.34	6.87	35.31	7.02	35.28	7.18	35.25	7.33	36
37	36.32	7.06	36.29	7.22	36.26	7.38	36.22	7.53	37
38	37.30	7.25	37.27	7.41	37.24	7.58	37.20	7.74	38
39	38.28	7.44	38.25	7.61	38.22	7.78	38.18	7.94	39
40	39.27	7.63	39.23	7.80	39.20	7.97	39.16	8.15	40
41	40.25	7 82	40.21	8.00	40.18	8.17	40.14	8.35	41
42	41.23	8.01	41.19	8 19	41.16	8.37	41.12	8.55	42
43	42.21	8.20	42.17	8.39	42.14	8.57	42.10	9.76	43
44	43.19	8.40	43.15	8.58	43.12	8.77	43.08	8.96	44
45	44.17	8.59	44 14	8.78	44.10	8.97	44.06	9.16	45
46	45.16	8.78	45.12	8.97	45.08	9.17	45.04	9.37	46
47	46.14	8.97	46.10	9.17	46.06	9.37	46.02	9.57	47
48	47.12	9.16	47.08	9.36	47.04	9.57	46.99	9.77	48
49	48.10	9.35	48 06	9.56	48.02	9.77	47.97	9.98	49
50	49.08	9.54	49.04	9.75	49.00	9.97	48.95	10.18	50
51	50.06	9.73	50.02	9.95	49.98	10.17	49.93	10.39	51
52	51.05	9.92	51.00	10.15	50.96	10.37	50 91	10.59	52
53	52.03	10.11	51.98	10 34	51.94	10.57	51.89	10.79	53
54	53.01	10.30	52.96	10.54	52.92	10.77	52.87	11.00	54
55	53.99	10.49	53.94	10.73	53.90	10.97	53.85	11.20	55
56	54.97	10.69	54.93	10.93	54.88	11.17	54.83	11.40	56
57	55.95	10.88	55.91	11.12	55.86	11.37	55.81	11.61	57
58	56.94	11.07	56.89	11.32	56.84	11.56	56.79	11 81	58
59	57.92	11.26	57.87	11.51	57.82	11.76	57 76	12.02	59
60	58.90	11.45	58.85	11.71	58.80	11.96	58.74	12.22	60
61	59 88	11.64	59.83	11.90	59.78	12.16	59 72	12.42	61
62	60.86	11.83	60.81	12.09	60.76	12.36	60.70	12 63	62
63	61.84	12.02	61.79	12.29	61.74	12.56	61.68	12.83	63
64	62.83	12 21	62.77	12.49	62.72	12.76	62.66	13.03	64
65	63.81	12.40	63.75	12.68	63.70	12.96	63.64	13 24	65
66	64.79	12.59	64.73	12.88	64.68	13.16	64.62	13 44	66
67	65.77	12.79	65.71	13.07	65.66	13.36	65.60	13 64	67
68	66.75	12.98	66.69	13.27	66.64	13 56	66.58	13 85	68
69	67.73	13.17	67 67	13.46	67.61	13.76	67.55	14.05	69
70	68.71	13.36	68.66	13.66	68.59	13.96	68.53	14.26	70
	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	
Dist.	79° 0′		78° 45′		78° 30′		78° 15′		Dist.

Dist	12° 0′		12° 15′		12° 30′		12° 45′		Dist.
	Lat.	Dep.	Lat.	Dep	Lat	Dep	Lat.	Dep.	
1	0.98	0.21	0.98	0.21	0.98	0.22	0.98	0.22	1
2	1.96	0.42	1.95	0.42	1.95	0.43	1.95	0.44	2
3	2.93	0.62	2.93	0.64	2.93	0.65	2.93	0.66	3
4	3.91	0.83	3.91	0.85	3.91	0.87	3.90	0.88	4
5	4.89	1.04	4.89	1.06	4.88	1.08	4.88	1.10	5
6	5.87	1.25	5.86	1.27	5.86	1.30	5.85	1.32	6
7	6.85	1.46	6.84	1.49	6.83	1.52	6.83	1.54	7
8	7.83	1.66	7.82	1.70	7.81	1.73	7.80	1.77	8
9	8.80	1.87	8.80	1.91	8.79	1.95	8.78	1.99	9
10	9.78	2.08	9.77	2.12	9.76	2.16	9.75	2.21	10
11	10.76	2.29	10.75	2.33	10.74	2.38	10.73	2.43	11
12	11.74	2.49	11.73	2.55	11.72	2.60	11.70	2.65	12
13	12.72	2.70	12.70	2.76	12.69	2.81	12.68	2.87	13
14	13.69	2.91	13.68	2.97	13.67	3.03	13.65	3.09	14
15	14.67	3.12	14.66	3.18	14.64	3.25	14.63	3.31	15
16	15.65	3.33	15.64	3.39	15.62	3.46	15.61	3.53	16
17	16.63	3.53	16.61	3.61	16.60	3.68	16.58	3.75	17
18	17.61	3.74	17.59	3.82	17.57	3.90	17.56	3.97	18
19	18.58	3.95	18.57	4.03	18.55	4.11	18.53	4.19	19
20	19.56	4.16	19.54	4.24	19.53	4.33	19.51	4.41	20
21	20.54	4.37	20.52	4.46	20.50	4.55	20.48	4.63	21
22	21.52	4.57	21.50	4.67	21.48	4.76	21.46	4.86	22
23	22.50	4.78	22.48	4.88	22.45	4.98	22.43	5.08	23
24	23.48	4.99	23.45	5.09	23.43	5.19	23.41	5.30	24
25	24.45	5.20	24.43	5.30	24.41	5.41	24.38	5.52	25
26	25.43	5.41	25.41	5.52	25.38	5.63	25.36	5.74	26
27	26.41	5.61	26.39	5.73	26.36	5.84	26.33	5.96	27
28	27.39	5.82	27.36	5.94	27.34	6.06	27.31	6.18	28
29	28.37	6.03	28.34	6.15	28.31	6.28	28.28	6.40	29
30	29.34	6.24	29.32	6.37	29.29	6.49	29.26	6.62	30
31	30.32	6.45	30.29	6.58	30.27	6.71	30.24	6.84	31
32	31.30	6.65	31.27	6.79	31.24	6.93	31.21	7.06	32
33	32.28	6.86	32.25	7.00	32.22	7.14	32.19	7.28	33
34	33.26	7.07	33.23	7.21	33.19	7.36	33.16	7.50	34
35	34.24	7.28	34.20	7.43	34.17	7.58	34.14	7.72	35
36	35.21	7.48	35.18	7.64	35.15	7.79	35.11	7.95	36
37	36.19	7.69	36.16	7.85	36.12	8.01	36.09	8.17	37
38	37.17	7.90	37.13	8.06	37.10	8.22	37.06	8.39	38
39	38.15	8.11	38.11	8.28	38.08	8.44	38.04	8.61	39
40	39.13	8.32	39.09	8.49	39.05	8.66	39.01	8.83	40
41	40.10	8.52	40.07	8.70	40.03	8.87	39.99	9.05	41
42	41.08	8.73	41.04	8.91	41.00	9.09	40.96	9.27	42
43	42.06	8.94	42.02	9.12	41.98	9.31	41.94	9.49	43
44	43.04	9.15	43.00	9.34	42.96	9.52	42.92	9.71	44
45	44.02	9.36	43.98	9.55	43.93	9.74	43.89	9.93	45
46	44.99	9.56	44.95	9.76	44.91	9.96	44.87	10.15	46
47	45.97	9.77	45.93	9.97	45.89	10.17	45.84	10.37	47
48	46.95	9.98	46.91	10.18	46.86	10.39	46.82	10.59	48
49	47.93	10.19	47.88	10.40	47.84	10.61	47.79	10.81	49
50	48.91	10.40	48.86	10.61	48.82	10.82	48.77	11.04	50
51	49.89	10.60	49.84	10.82	49.79	11.04	49.74	11.26	51
52	50.86	10.81	50.82	11.03	50.77	11.26	50.72	11.48	52
53	51.84	11.02	51.79	11.25	51.74	11.47	51.69	11.70	53
54	52.82	11.23	52.77	11.46	52.72	11.69	52.67	11.92	54
55	53.80	11.44	53.75	11.67	53.70	11.91	53.65	12.14	55
56	54.78	11.64	54.73	11.88	54.67	12.12	54.62	12.36	56
57	55.76	11.85	55.70	12.09	55.65	12.34	55.60	12.58	57
58	56.73	12.06	56.68	12.31	56.63	12.55	56.57	12.80	58
59	57.71	12.27	57.66	12.52	57.60	12.77	57.55	13.02	59
60	58.69	12.48	58.63	12.73	58.58	12.99	58.52	13.24	60
61	59.67	12.68	59.61	12.94	59.55	13.20	59.50	13.46	61
62	60.65	12.89	60.59	13.16	60.53	13.42	60.47	13.68	62
63	61.62	13.10	61.57	13.37	61.51	13.64	61.45	13.90	63
64	62.60	13.31	62.54	13.58	62.48	13.85	62.42	14.13	64
65	63.58	13.52	63.52	13.79	63.46	14.07	63.40	14.35	65
66	64.56	13.72	64.50	14.00	64.44	14.29	64.37	14.57	66
67	65.54	13.93	65.48	14.22	65.41	14.50	65.35	14.79	67
68	66.51	14.14	66.45	14.43	66.39	14.72	66.32	15.01	68
69	67.49	14.35	67.43	14.64	67.37	14.93	67.30	15.23	69
70	68.47	14.55	68.41	14.85	68.34	15.15	68.27	15.45	70
Dist.	Dep.	Lat	Dep.	Lat.	Dep.	Lat	Dep.	Lat.	Dist.
	78°	0′	77°	45′	77°	30′	77°	15′	

Dist.	13° 0′		13° 15′		13° 30′		13° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	
1	0.97	0.23	0.97	0.23	0.97	0.23	0.97	0.24	1
2	1.95	0.45	1.95	0.46	1.94	0.47	1.94	0.48	2
3	2.92	0.67	2.92	0.69	2.92	0.70	2.91	0.71	3
4	3.90	0.90	3.89	0.92	3.89	0.93	3.89	0.95	4
5	4.87	1.12	4.87	1.15	4.86	1.17	4.86	1.19	5
6	5.85	1.35	5.84	1.38	5.83	1.40	5.83	1.43	6
7	6.82	1.57	6.81	1.60	6.81	1.63	6.80	1.66	7
8	7.80	1.80	7.79	1.83	7.78	1.87	7.77	1.90	8
9	8.77	2.02	8.76	2.06	8.75	2.10	8.74	2.14	9
10	9.74	2.25	9.73	2.29	9.72	2.33	9.71	2.38	10
11	10.72	2.47	10.71	2.52	10.70	2.57	10.68	2.61	11
12	11.69	2.70	11.68	2.75	11.67	2.80	11.66	2.85	12
13	12.67	2.92	12.65	2.98	12.64	3.03	12.63	3.09	13
14	13.64	3.15	13.63	3.21	13.61	3.27	13.60	3.33	14
15	14.62	3.37	14.60	3.44	14.59	3.50	14.57	3.57	15
16	15.59	3.60	15.57	3.67	15.56	3.74	15.54	3.80	16
17	16.56	3.82	16.55	3.90	16.53	3.97	16.51	4.04	17
18	17.54	4.05	17.52	4.13	17.50	4.20	17.48	4.28	18
19	18.51	4.27	18.49	4.35	18.48	4.44	18.46	4.52	19
20	19.49	4.50	19.47	4.58	19.45	4.67	19.43	4.75	20
21	20.46	4.72	20.44	4.81	20.42	4.90	20.40	4.99	21
22	21.44	4.95	21.41	5.04	21.39	5.14	21.37	5.23	22
23	22.41	5.17	22.39	5.27	22.36	5.37	22.34	5.47	23
24	23.38	5.40	23.36	5.50	23.34	5.60	23.31	5.70	24
25	24.36	5.62	24.33	5.73	24.31	5.84	24.28	5.94	25
26	25.33	5.85	25.31	5.96	25.28	6.07	25.25	6.18	26
27	26.31	6.07	26.28	6.19	26.25	6.30	26.23	6.42	27
28	27.28	6.30	27.25	6.42	27.23	6.54	27.20	6.66	28
29	28.26	6.52	28.23	6.65	28.20	6.77	28.17	6.89	29
30	29.23	6.75	29.20	6.88	29.17	7.00	29.14	7.13	30
31	30.21	6.97	30.17	7.11	30.14	7.24	30.11	7.37	31
32	31.18	7.20	31.15	7.33	31.12	7.47	31.08	7.61	32
33	32.15	7.42	32.12	7.56	32.09	7.70	32.05	7.84	33
34	33.13	7.65	33.09	7.79	33.06	7.94	33.03	8.08	34
35	34.10	7.87	34.07	8.02	34.03	8.17	34.00	8.32	35
36	35.08	8.10	35.04	8.25	35.01	8.40	34.97	8.56	36
37	36.05	8.32	36.02	8.48	35.98	8.64	35.94	8.79	37
38	37.03	8.55	36.99	8.71	36.95	8.87	36.91	9.03	38
39	38.00	8.77	37.96	8.94	37.92	9.10	37.88	9.27	39
40	38.97	9.00	38.94	9.17	38.89	9.34	38.85	9.51	40
41	39.95	9.22	39.91	9.40	39.87	9.57	39.82	9.75	41
42	40.92	9.45	40.88	9.63	40.84	9.80	40.80	9.98	42
43	41.90	9.67	41.86	9.86	41.81	10.04	41.77	10.22	43
44	42.87	9.90	42.83	10.08	42.78	10.27	42.74	10.46	44
45	43.85	10.12	43.80	10.31	43.76	10.51	43.71	10.70	45
46	44.82	10.35	44.78	10.54	44.73	10.74	44.68	10.93	46
47	45.80	10.57	45.75	10.77	45.70	10.97	45.65	11.17	47
48	46.77	10.80	46.72	11.00	46.67	11.21	46.62	11.41	48
49	47.74	11.02	47.70	11.23	47.65	11.44	47.60	11.65	49
50	48.72	11.25	48.67	11.46	48.62	11.67	48.57	11.88	50
51	49.69	11.47	49.64	11.69	49.59	11.91	49.54	12.12	51
52	50.67	11.70	50.62	11.92	50.56	12.14	50.51	12.36	52
53	51.64	11.92	51.59	12.15	51.54	12.37	51.48	12.60	53
54	52.62	12.15	52.56	12.38	52.51	12.61	52.45	12.84	54
55	53.59	12.37	53.54	12.61	53.48	12.84	53.42	13.07	55
56	54.57	12.60	54.51	12.84	54.45	13.07	54.40	13.31	56
57	55.54	12.82	55.48	13.06	55.43	13.31	55.37	13.55	57
58	56.51	13.05	56.46	13.29	56.40	13.54	56.34	13.79	58
59	57.49	13.27	57.43	13.52	57.37	13.77	57.31	14.02	59
60	58.46	13.50	58.40	13.75	58.34	14.01	58.28	14.26	60
61	59.44	13.72	59.38	13.98	59.31	14.24	59.25	14.50	61
62	60.41	13.95	60.35	14.21	60.29	14.47	60.22	14.74	62
63	61.38	14.17	61.33	14.44	61.26	14.71	61.19	14.97	63
64	62.36	14.40	62.30	14.67	62.23	14.94	62.17	15.21	64
65	63.33	14.62	63.27	14.90	63.20	15.17	63.14	15.45	65
66	64.31	14.85	64.25	15.13	64.18	15.41	64.11	15.69	66
67	65.28	15.07	65.22	15.36	65.15	15.64	65.08	15.93	67
68	66.26	15.30	66.19	15.59	66.12	15.88	66.05	16.16	68
69	67.23	15.52	67.16	15.82	67.09	16.11	67.02	16.40	69
70	68.21	15.75	68.14	16.04	68.07	16.34	67.99	16.64	70
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat.	Dep	Lat.	Dist.
	77°	0′	76°	45′	76°	30′	76°	15′	

Dist.	14° 0'		14° 15'		14° 30'		14° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.97	0.24	0.97	0.25	0.97	0.25	0.97	0.25	1
2	1.94	0.48	1.94	0.49	1.94	0.50	1.93	0.51	2
3	2.91	0.73	2.91	0.74	2.90	0.75	2.90	0.76	3
4	3.88	0.97	3.88	0.98	3.87	1.00	3.87	1.02	4
5	4.85	1.21	4.85	1.23	4.84	1.25	4.84	1.27	5
6	5.82	1.45	5.82	1.48	5.81	1.50	5.80	1.53	6
7	6.79	1.69	6.78	1.72	6.78	1.75	6.77	1.78	7
8	7.76	1.94	7.75	1.97	7.75	2.00	7.74	2.04	8
9	8.73	2.18	8.72	2.22	8.71	2.25	8.70	2.29	9
10	9.70	2.42	9.69	2.46	9.68	2.50	9.67	2.55	10
11	10.67	2.66	10.66	2.71	10.65	2.75	10.64	2.80	11
12	11.64	2.90	11.63	2.95	11.62	3.00	11.60	3.06	12
13	12.61	3.14	12.60	3.20	12.59	3.25	12.57	3.31	13
14	13.58	3.39	13.57	3.45	13.55	3.51	13.54	3.56	14
15	14.55	3.63	14.54	3.69	14.52	3.76	14.51	3.82	15
16	15.52	3.87	15.51	3.94	15.49	4.01	15.47	4.07	16
17	16.50	4.11	16.48	4.18	16.46	4.26	16.44	4.33	17
18	17.47	4.35	17.45	4.43	17.43	4.51	17.41	4.58	18
19	18.44	4.60	18.42	4.68	18.39	4.76	18.37	4.84	19
20	19.41	4.34	19.38	4.92	19.36	5.01	19.34	5.09	20
21	20.38	5.08	20.35	5.17	20.33	5.26	20.31	5.35	21
22	21.35	5.32	21.32	5.42	21.30	5.51	21.28	5.60	22
23	22.32	5.56	22.29	5.66	22.27	5.76	22.24	5.86	23
24	23.29	5.81	23.26	5.91	23.24	6.01	23.21	6.11	24
25	24.26	6.05	24.23	6.15	24.20	6.26	24.18	6.36	25
26	25.23	6.29	25.20	6.40	25.17	6.51	25.14	6.62	26
27	26.20	6.53	26.17	6.65	26.14	6.76	26.11	6.87	27
28	27.17	6.77	27.14	6.89	27.11	7.01	27.08	7.13	28
29	28.14	7.02	28.11	7.14	28.08	7.26	28.04	7.38	29
30	29.11	7.26	29.08	7.38	29.04	7.51	29.01	7.64	30
31	30.08	7.50	30.05	7.63	30.01	7.76	29.98	7.89	31
32	31.05	7.74	31.02	7.88	30.98	8.01	30.95	8.15	32
33	32.02	7.98	31.98	8.12	31.95	8.26	31.91	8.40	33
34	32.99	8.23	32.95	8.37	32.92	8.51	32.88	8.66	34
35	33.96	8.47	33.92	8.62	33.89	8.76	33.85	8.91	35
36	34.93	8.71	34.89	8.86	34.85	9.01	34.81	9.17	36
37	35.90	8.95	35.86	9.11	35.82	9.26	35.78	9.42	37
38	36.87	9.19	36.83	9.35	36.79	9.51	36.75	9.67	38
39	37.84	9.43	37.80	9.60	37.76	9.76	37.71	9.93	39
40	38.81	9.68	38.77	9.85	38.73	10.02	38.68	10.18	40
41	39.78	9.92	39.74	10.09	39.69	10.27	39.65	10.44	41
42	40.75	10.16	40.71	10.34	40.66	10.52	40.62	10.69	42
43	41.72	10.40	41.68	10.58	41.63	10.77	41.58	10.95	43
44	42.69	10.64	42.65	10.83	42.60	11.02	42.55	11.20	44
45	43.66	10.89	43.62	11.08	43.57	11.27	43.52	11.46	45
46	44.63	11.13	44.58	11.32	44.53	11.52	44.48	11.71	46
47	45.60	11.37	45.55	11.57	45.50	11.77	45.45	11.97	47
48	46.57	11.61	46.52	11.82	46.47	12.02	46.42	12.22	48
49	47.54	11.85	47.49	12.06	47.44	12.27	47.39	12.48	49
50	48.51	12.10	48.46	12.31	48.41	12.52	48.35	12.73	50
51	49.48	12.34	49.43	12.55	49.38	12.77	49.32	12.98	51
52	50.46	12.58	50.40	12.80	50.34	13.02	50.29	13.24	52
53	51.43	12.82	51.37	13.05	51.31	13.27	51.25	13.49	53
54	52.40	13.06	52.34	13.29	52.28	13.52	52.22	13.75	54
55	53.37	13.31	53.31	13.54	53.25	13.77	53.19	14.00	55
56	54.34	13.55	54.28	13.78	54.22	14.02	54.15	14.26	56
57	55.31	13.79	55.25	14.03	55.18	14.27	55.12	14.51	57
58	56.28	14.03	56.22	14.28	56.15	14.52	56.09	14.77	58
59	57.25	14.27	57.19	14.52	57.12	14.77	57.06	15.02	59
60	58.21	14.51	58.15	14.77	58.09	15.02	58.02	15.28	60
61	59.19	14.76	59.12	15.01	59.06	15.27	58.99	15.53	61
62	60.16	15.00	60.09	15.26	60.02	15.52	59.96	15.78	62
63	61.13	15.24	61.06	15.51	60.99	15.77	60.92	16.04	63
64	62.10	15.48	62.03	15.75	61.96	16.02	61.89	16.29	64
65	63.07	15.72	63.00	16.00	62.93	16.27	62.86	16.55	65
66	64.04	15.97	63.97	16.25	63.90	16.52	63.82	16.80	66
67	65.01	16.21	64.94	16.49	64.87	16.78	64.79	17.06	67
68	65.98	16.45	65.91	16.74	65.83	17.03	65.76	17.31	68
69	66.95	16.69	66.88	16.98	66.80	17.28	66.73	17.57	69
70	67.92	16.93	67.85	17.23	67.77	17.53	67.69	17.82	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	76° 0'		75° 45'		75° 30'		75° 15'		

Dist.	15° 0′		15° 15′		15° 30′		15° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.97	0.26	0.96	0.26	0.96	0.27	0.96	0.27	1
2	1.93	0.52	1.93	0.53	1.93	0.53	1.92	0.54	2
3	2.90	0.78	2.89	0.79	2.89	0.80	2.89	0.81	3
4	3.86	1.04	3.86	1.05	3.85	1.07	3.85	1.09	4
5	4.83	1.29	4.82	1.32	4.82	1.34	4.81	1.36	5
6	5.80	1.55	5.79	1.58	5.78	1.60	5.77	1.63	6
7	6.76	1.81	6.75	1.84	6.75	1.87	6.74	1.90	7
8	7.73	2.07	7.72	2.10	7.71	2.14	7.70	2.17	8
9	8.69	2.33	8.68	2.37	8.67	2.41	8.66	2.44	9
10	9.66	2.59	9.65	2.63	9.64	2.67	9.62	2.71	10
11	10.63	2.85	10.61	2.89	10.60	2.94	10.59	2.99	11
12	11.59	3.11	11.58	3.16	11.56	3.21	11.55	3.26	12
13	12.56	3.36	12.54	3.42	12.53	3.47	12.51	3.53	13
14	13.52	3.62	13.51	3.68	13.49	3.74	13.47	3.80	14
15	14.49	3.88	14.47	3.95	14.45	4.01	14.44	4.07	15
16	15.45	4.14	15.44	4.21	15.42	4.28	15.40	4.34	16
17	16.42	4.40	16.40	4.47	16.38	4.54	16.36	4.61	17
18	17.39	4.66	17.37	4.73	17.35	4.81	17.32	4.89	18
19	18.35	4.92	18.33	5.00	18.31	5.08	18.29	5.16	19
20	19.32	5.18	19.30	5.26	19.27	5.34	19.25	5.43	20
21	20.28	5.44	20.26	5.52	20.24	5.61	20.21	5.70	21
22	21.25	5.69	21.23	5.79	21.20	5.88	21.17	5.97	22
23	22.22	5.95	22.19	6.05	22.16	6.15	22.14	6.24	23
24	23.18	6.21	23.15	6.31	23.13	6.41	23.10	6.51	24
25	24.15	6.47	24.12	6.58	24.09	6.68	24.06	6.79	25
26	25.11	6.73	25.08	6.84	25.05	6.95	25.02	7.06	26
27	26.08	6.99	26.05	7.10	26.02	7.22	25.99	7.33	27
28	27.05	7.25	27.01	7.36	26.98	7.48	26.95	7.60	28
29	28.01	7.51	27.98	7.63	27.95	7.75	27.91	7.87	29
30	28.98	7.76	28.94	7.89	28.91	8.02	28.87	8.14	30
31	29.94	8.02	29.91	8.15	29.87	8.28	20.84	8.41	31
32	30.91	8.28	30.87	8.42	30.84	8.55	30.80	8.69	32
33	31.88	8.54	31.84	8.68	31.80	8.82	31.76	8.96	33
34	32.84	8.80	32.80	8.94	32.76	9.09	32.72	9.23	34
35	33.81	9.06	33.77	9.21	33.73	9.35	33.69	9.50	35
36	34.77	9.32	34.73	9.47	34.69	9.62	34.65	9.77	36
37	35.74	9.58	35.70	9.73	35.65	9.89	35.61	10.04	37
38	36.71	9.84	36.66	10.00	36.62	10.16	36.57	10.31	38
39	37.67	10.09	37.63	10.26	37.58	10.42	37.54	10.59	39
40	38.64	10.35	38.59	10.52	38.55	10.69	38.50	10.86	40
41	39.60	10.61	39.56	10.78	39.51	10.96	39.46	11.13	41
42	40.57	10.87	40.52	11.05	40.47	11.22	40.42	11.40	42
43	41.53	11.13	41.49	11.31	41.44	11.49	41.39	11.67	43
44	42.50	11.39	42.45	11.57	42.40	11.76	42.35	11.94	44
45	43.47	11.65	43.42	11.84	43.36	12.03	43.31	12.21	45
46	44.43	11.91	44.38	12.10	44.33	12.29	44.27	12.49	46
47	45.40	12.16	45.35	12.36	45.29	12.56	45.24	12.76	47
48	46.36	12.42	46.31	12.63	46.25	12.83	46.20	13.03	48
49	47.33	12.68	47.27	12.89	47.22	13.09	47.16	13.30	49
50	48.30	12.94	48.24	13.15	48.18	13.36	48.12	13.57	50
51	49.26	13.20	49.20	13.41	49.15	13.62	49.09	13.84	51
52	50.23	13.46	50.17	13.68	50.11	13.90	50.05	14.11	52
53	51.19	13.72	51.13	13.94	51.07	14.16	51.01	14.39	53
54	52.16	13.98	52.10	14.20	52.04	14.43	51.97	14.66	54
55	53.13	14.23	53.06	14.47	53.00	14.70	52.94	14.93	55
56	54.09	14.49	54.03	14.73	53.96	14.96	53.90	15.20	56
57	55.06	14.75	54.99	14.99	54.93	15.23	54.86	15.47	57
58	56.02	15.01	55.96	15.26	55.89	15.50	55.82	15.74	58
59	56.99	15.27	56.92	15.52	56.85	15.77	56.79	16.02	59
60	57.96	15.53	57.89	15.78	57.82	16.03	57.75	16.29	60
61	58.92	15.79	58.85	16.04	58.78	16.30	58.71	16.56	61
62	59.89	16.05	59.82	16.31	59.74	16.57	59.67	16.83	62
63	60.85	16.30	60.78	16.57	60.71	16.84	60.63	17.10	63
64	61.82	16.56	61.75	16.83	61.67	17.10	61.60	17.37	64
65	62.79	16.82	62.71	17.10	62.64	17.37	62.56	17.64	65
66	63.75	17.08	63.68	17.36	63.60	17.64	63.52	17.91	66
67	64.72	17.34	64.64	17.62	64.56	17.90	64.48	18.19	67
68	65.68	17.60	65.60	17.89	65.53	18.17	65.45	18.46	68
69	66.65	17.86	66.57	18.15	66.49	18.44	66.41	18.73	69
70	67.61	18.12	67.54	18.41	67.45	18.71	67.37	19.00	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist
	75° 0′		74° 45′		74° 30′		74° 15′		

Dist.	16° 0′		16° 15′		16° 30′		16° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.96	0.28	0.96	0.28	0.96	0.28	0.96	0.29	1
2	1.92	0.55	1.92	0.56	1.92	0.57	1.92	0.58	2
3	2.88	0.83	2.88	0.84	2.88	0.85	2.87	0.86	3
4	3.85	1.10	3.84	1.12	3.84	1.14	3.83	1.15	4
5	4.81	1.38	4.79	1.40	4.79	1.42	4.79	1.44	5
6	5.77	1.65	5.76	1.68	5.75	1.70	5.75	1.73	6
7	6.73	1.93	6.72	1.96	6.71	1.99	6.70	2.02	7
8	7.69	2.21	7.68	2.24	7.67	2.27	7.66	2.31	8
9	8.65	2.48	8.64	2.52	8.63	2.56	8.62	2.59	9
10	9.61	2.76	9.60	2.80	9.59	2.84	9.58	2.88	10
11	10.57	3.03	10.56	3.08	10.55	3.12	10.53	3.17	11
12	11.54	3.31	11.52	3.36	11.51	3.41	11.49	3.46	12
13	12.50	3.58	12.48	3.64	12.46	3.69	12.45	3.75	13
14	13.46	3.86	13.44	3.92	13.42	3.98	13.41	4.03	14
15	14.42	4.13	14.40	4.20	14.38	4.26	14.36	4.32	15
16	15.38	4.41	15.36	4.48	15.34	4.54	15.32	4.61	16
17	16.34	4.69	16.32	4.76	16.30	4.83	16.28	4.90	17
18	17.30	4.96	17.28	5.04	17.26	5.11	17.24	5.19	18
19	18.26	5.24	18.24	5.32	18.22	5.40	18.19	5.48	19
20	19.23	5.51	19.20	5.60	19.18	5.68	19.15	5.76	20
21	20.19	5.79	20.16	5.88	20.14	5.96	20.11	6.05	21
22	21.15	6.06	21.12	6.16	21.09	6.25	21.07	6.34	22
23	22.11	6.34	22.08	6.44	22.05	6.53	22.02	6.63	23
24	23.07	6.62	23.04	6.72	23.01	6.82	22.98	6.92	24
25	24.03	6.89	24.00	7.00	23.97	7.10	23.94	7.21	25
26	24.99	7.17	24.96	7.28	24.93	7.38	24.90	7.49	26
27	25.95	7.44	25.92	7.56	25.89	7.67	25.85	7.78	27
28	26.92	7.72	26.88	7.84	26.85	7.95	26.81	8.07	28
29	27.88	7.99	27.84	8.12	27.81	8.24	27.77	8.36	29
30	28.84	8.27	28.80	8.39	28.76	8.52	28.73	8.65	30
31	29.80	8.54	29.76	8.67	29.72	8.80	29.68	8.93	31
32	30.76	8.82	30.72	8.95	30.68	9.09	30.64	9.22	32
33	31.72	9.10	31.68	9.23	31.64	9.37	31.60	9.51	33
34	32.68	9.37	32.64	9.51	32.60	9.66	32.56	9.80	34
35	33.64	9.65	33.60	9.79	33.56	9.94	33.51	10.09	35
36	34.61	9.92	34.56	10.07	34.52	10.22	34.47	10.38	36
37	35.57	10.20	35.52	10.35	35.48	10.51	35.43	10.66	37
38	36.53	10.47	36.48	10.63	36.44	10.79	36.39	10.95	38
39	37.49	10.75	37.44	10.91	37.39	11.08	37.35	11.24	39
40	38.45	11.03	38.40	11.19	38.35	11.36	38.30	11.53	40
41	39.41	11.30	39.36	11.47	39.31	11.64	39.26	11.82	41
42	40.37	11.58	40.32	11.75	40.27	11.93	40.22	12.10	42
43	41.33	11.85	41.28	12.03	41.23	12.21	41.18	12.39	43
44	42.30	12.13	42.24	12.31	42.19	12.50	42.13	12.68	44
45	43.26	12.40	43.20	12.59	43.15	12.78	43.09	12.97	45
46	44.22	12.68	44.16	12.87	44.11	13.06	44.05	13.26	46
47	45.18	12.96	45.12	13.15	45.06	13.35	45.01	13.55	47
48	46.14	13.23	46.08	13.43	46.02	13.63	45.96	13.83	48
49	47.10	13.51	47.04	13.71	46.98	13.92	46.92	14.12	49
50	48.06	13.78	48.00	13.99	47.94	14.20	47.88	14.41	50
51	49.02	14.06	48.96	14.27	48.90	14.49	48.84	14.70	51
52	49.99	14.33	49.92	14.55	49.86	14.78	49.79	14.98	52
53	50.95	14.61	50.88	14.83	50.82	15.05	50.75	15.28	53
54	51.91	14.89	51.84	15.11	51.78	15.34	51.71	15.56	54
55	52.87	15.16	52.80	15.39	52.74	15.62	52.67	15.85	55
56	53.83	15.44	53.76	15.67	53.69	15.91	53.62	16.14	56
57	54.79	15.71	54.72	15.95	54.65	16.19	54.58	16.43	57
58	55.75	15.99	55.68	16.23	55.61	16.47	55.54	16.72	58
59	56.71	16.26	56.64	16.51	56.57	16.76	56.50	17.00	59
60	57.68	16.54	57.60	16.79	57.53	17.04	57.45	17.29	60
61	58.64	16.81	58.56	17.07	58.49	17.33	58.41	17.58	61
62	59.60	17.09	59.52	17.35	59.45	17.61	59.37	17.87	62
63	60.56	17.36	60.48	17.63	60.41	17.89	60.33	18.16	63
64	61.52	17.64	61.44	17.91	61.36	18.18	61.28	18.45	64
65	62.48	17.92	62.40	18.19	62.32	18.46	62.24	18.73	65
66	63.44	18.19	63.36	18.47	63.28	18.75	63.20	19.02	66
67	64.40	18.47	64.32	18.75	64.24	19.03	64.16	19.31	67
68	65.37	18.74	65.28	19.03	65.20	19.31	65.11	19.60	68
69	66.33	19.02	66.24	19.31	66.16	19.60	66.07	19.89	69
70	67.29	19.30	67.20	19.59	67.12	19.88	67.03	20.17	70
Dist.	Dep	Lat	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	74° 0′		73° 45′		73° 30′		73° 15′		

Dist.	17° 0′		17° 15′		17° 30′		17° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.96	0.29	0.96	0.30	0.95	0.30	0.95	0.30	1
2	1.91	0.58	1.91	0.59	1.91	0.60	1.90	0.61	2
3	2.87	0.88	2.87	0.89	2.86	0.90	2.86	0.91	3
4	3.83	1.17	3.82	1.19	3.81	1.20	3.81	1.22	4
5	4.78	1.46	4.78	1.48	4.77	1.50	4.76	1.52	5
6	5.74	1.75	5.73	1.78	5.72	1.80	5.71	1.83	6
7	6.69	2.05	6.69	2.08	6.68	2.10	6.67	2.13	7
8	7.65	2.34	7.64	2.37	7.63	2.41	7.62	2.44	8
9	8.61	2.63	8.60	2.67	8.58	2.71	8.57	2.74	9
10	9.56	2.92	9.55	2.97	9.54	3.01	9.52	3.05	10
11	10.52	3.22	10.51	3.26	10.49	3.31	10.48	3.35	11
12	11.48	3.51	11.46	3.56	11.44	3.61	11.43	3.66	12
13	12.43	3.80	12.42	3.86	12.40	3.91	12.38	3.96	13
14	13.39	4.09	13.37	4.15	13.35	4.21	13.33	4.27	14
15	14.34	4.39	14.33	4.45	14.31	4.51	14.29	4.57	15
16	15.30	4.68	15.28	4.74	15.26	4.81	15.24	4.88	16
17	16.26	4.97	16.24	5.04	16.21	5.11	16.19	5.18	17
18	17.21	5.26	17.19	5.34	17.17	5.41	17.14	5.49	18
19	18.17	5.56	18.15	5.63	18.12	5.71	18.10	5.79	19
20	19.13	5.85	19.10	5.93	19.07	6.01	19.05	6.10	20
21	20.08	6.14	20.06	6.23	20.03	6.31	20.00	6.40	21
22	21.04	6.43	21.01	6.52	20.98	6.62	20.95	6.71	22
23	21.99	6.72	21.97	6.82	21.94	6.92	21.91	7.01	23
24	22.95	7.02	22.92	7.12	22.89	7.22	22.86	7.32	24
25	23.91	7.31	23.88	7.41	23.84	7.52	23.81	7.62	25
26	24.86	7.60	24.83	7.71	24.80	7.82	24.76	7.93	26
27	25.82	7.89	25.79	8.01	25.75	8.12	25.71	8.23	27
28	26.78	8.19	26.74	8.30	26.70	8.42	26.67	8.54	28
29	27.73	8.48	27.70	8.60	27.66	8.72	27.62	8.84	29
30	28.69	8.77	28.65	8.90	28.61	9.02	28.57	9.15	30
31	29.65	9.06	29.61	9.19	29.57	9.32	29.52	9.45	31
32	30.60	9.36	30.56	9.49	30.52	9.62	30.48	9.76	32
33	31.56	9.65	31.52	9.79	31.47	9.92	31.43	10.06	33
34	32.51	9.94	32.47	10.08	32.43	10.22	32.38	10.37	34
35	33.47	10.23	33.43	10.38	33.38	10.52	33.33	10.67	35
36	34.43	10.53	34.38	10.68	34.33	10.83	34.29	10.97	36
37	35.38	10.82	35.34	10.97	35.29	11.13	35.24	11.28	37
38	36.34	11.11	36.29	11.27	36.24	11.43	36.19	11.58	38
39	37.30	11.40	37.25	11.57	37.20	11.73	37.14	11.89	39
40	38.25	11.69	38.20	11.86	38.15	12.03	38.10	12.19	40
41	39.21	11.99	39.16	12.16	39.10	12.33	39.05	12.50	41
42	40.16	12.28	40.11	12.45	40.06	12.63	40.00	12.80	42
43	41.12	12.57	41.07	12.75	41.01	12.93	40.95	13.11	43
44	42.08	12.86	42.02	13.05	41.96	13.23	41.91	13.41	44
45	43.03	13.16	42.98	13.34	42.92	13.53	42.86	13.72	45
46	43.99	13.45	43.93	13.64	43.87	13.83	43.81	14.02	46
47	44.95	13.74	44.89	13.94	44.82	14.13	44.76	14.33	47
48	45.90	14.03	45.84	14.23	45.78	14.43	45.72	14.63	48
49	46.86	14.33	46.80	14.53	46.73	14.73	46.67	14.94	49
50	47.82	14.62	47.75	14.83	47.69	15.04	47.62	15.24	50
51	48.77	14.91	48.71	15.12	48.64	15.34	48.57	15.55	51
52	49.73	15.20	49.66	15.42	49.59	15.64	49.53	15.85	52
53	50.68	15.50	50.62	15.72	50.55	15.94	50.48	16.16	53
54	51.64	15.79	51.57	16.01	51.50	16.24	51.43	16.46	54
55	52.60	16.08	52.53	16.31	52.46	16.54	52.38	16.77	55
56	53.55	16.37	53.48	16.61	53.41	16.84	53.34	17.07	56
57	54.51	16.67	54.44	16.90	54.36	17.14	54.29	17.38	57
58	55.47	16.96	55.39	17.20	55.32	17.44	55.24	17.68	58
59	56.42	17.25	56.35	17.50	56.27	17.74	56.19	17.99	59
60	57.38	17.54	57.30	17.79	57.22	18.04	57.14	18.29	60
61	58.33	17.83	58.26	18.09	58.18	18.34	58.10	18.60	61
62	59.29	18.13	59.21	18.39	59.13	18.64	59.05	18.90	62
63	50.25	18.42	60.17	18.68	60.08	18.95	60.00	19.21	63
64	61.20	18.71	61.12	18.98	61.04	19.25	60.95	19.51	64
65	62.16	19.00	62.08	19.27	61.99	19.55	61.91	19.82	65
66	63.12	19.30	63.03	19.57	62.95	19.85	62.86	20.12	66
67	64.07	19.59	63.99	19.87	63.90	20.15	63.81	20.43	67
68	65.03	19.88	64.94	20.16	64.85	20.45	64.76	20.73	68
69	65.99	20.17	65.90	20.46	65.81	20.75	65.72	21.04	69
70	66.94	20.47	66.85	20.76	66.76	21.05	66.67	21.34	70
Dist.	Dep	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	73°	0′	72°	45′	72°	30′	72°	15′	

Dist.	18° 0′		18° 15′		18° 30′		18° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.95	0.31	0.95	0.31	0.95	0.32	0.95	0.32	1
2	1.90	0.62	1.90	0.63	1.90	0.63	1.89	0.64	2
3	2.85	0.93	2.85	0.94	2.84	0.95	2.84	0.96	3
4	3.80	1.24	3.80	1.25	3.79	1.27	3.79	1.29	4
5	4.76	1.55	4.75	1.57	4.74	1.59	4.73	1.61	5
6	5.71	1.85	5.70	1.88	5.69	1.90	5.68	1.93	6
7	6.66	2.16	6.65	2.19	6.64	2.22	6.63	2.25	7
8	7.61	2.47	7.60	2.51	7.59	2.54	7.58	2.57	8
9	8.56	2.78	8.55	2.82	8.53	2.86	8.52	2.89	9
10	9.51	3.09	9.50	3.13	9.48	3.17	9.47	3.21	10
11	10.46	3.40	10.45	3.44	10.43	3.49	10.42	3.54	11
12	11.41	3.71	11.40	3.76	11.38	3.81	11.36	3.86	12
13	12.36	4.02	12.35	4.07	12.33	4.12	12.31	4.18	13
14	13.31	4.33	13.30	4.38	13.28	4.44	13.26	4.50	14
15	14.27	4.65	14.25	4.70	14.22	4.76	14.20	4.82	15
16	15.22	4.94	15.20	5.01	15.17	5.08	15.15	5.14	16
17	16.17	5.25	16.14	5.32	16.12	5.39	16.10	5.46	17
18	17.12	5.56	17.09	5.64	17.07	5.71	17.04	5.79	18
19	18.07	5.87	18.04	5.95	18.02	6.03	17.99	6.11	19
20	19.02	6.18	18.99	6.26	18.97	6.35	18.94	6.43	20
21	19.97	6.49	19.94	6.58	19.91	6.66	19.89	6.75	21
22	20.92	6.80	20.89	6.89	20.86	6.98	20.83	7.07	22
23	21.87	7.11	21.84	7.20	21.81	7.30	21.78	7.39	23
24	22.83	7.42	22.79	7.52	22.76	7.62	22.73	7.71	24
25	23.78	7.73	23.74	7.83	23.71	7.93	23.67	8.04	25
26	24.73	8.03	24.69	8.14	24.66	8.25	24.62	8.36	26
27	25.68	8.34	25.64	8.46	25.60	8.57	25.57	8.68	27
28	26.63	8.65	26.59	8.77	26.55	8.88	26.51	9.00	28
29	27.58	8.96	27.54	9.08	27.50	9.20	27.46	9.32	29
30	28.53	9.27	28.49	9.39	28.45	9.52	28.41	9.64	30
31	29.48	9.58	29.44	9.71	29.40	9.84	29.35	9.96	31
32	30.43	9.89	30.39	10.02	30.35	10.15	30.30	10.29	32
33	31.38	10.20	31.34	10.33	31.29	10.47	31.25	10.61	33
34	32.34	10.51	32.29	10.65	32.24	10.79	32.20	10.93	34
35	33.29	10.82	33.24	10.96	33.19	11.11	33.14	11.25	35
36	34.24	11.12	34.19	11.27	34.14	11.42	34.09	11.57	36
37	35.19	11.43	35.14	11.59	35.09	11.74	35.04	11.89	37
38	36.14	11.74	36.09	11.90	36.04	12.06	35.98	12.21	38
39	37.09	12.05	37.04	12.21	36.98	12.37	36.93	12.54	39
40	38.04	12.36	37.99	12.53	37.93	12.69	37.88	12.86	40
41	38.99	12.67	38.94	12.84	38.88	13.01	38.82	13.18	41
42	39.94	12.98	39.89	13.15	39.83	13.33	39.77	13.50	42
43	40.90	13.29	40.84	13.47	40.78	13.64	40.72	13.82	43
44	41.85	13.60	41.79	13.98	41.73	13.96	41.66	14.14	44
45	42.80	13.91	42.74	14.09	42.67	14.28	42.61	14.46	45
46	43.75	14.21	43.69	14.41	43.62	14.60	43.56	14.79	46
47	44.70	14.52	44.64	14.72	44.57	14.91	44.51	15.11	47
48	45.65	14.83	45.59	15.03	45.52	15.23	45.45	15.43	48
49	46.60	15.14	46.54	15.34	46.47	15.55	46.40	15.75	49
50	47.55	15.45	47.48	15.66	47.42	15.86	47.35	16.07	50
51	48.50	15.76	48.43	15.97	48.36	16.18	48.29	16.39	51
52	49.45	16.07	49.38	16.28	49.31	16.50	49.24	16.71	52
53	50.41	16.38	50.33	16.60	50.26	16.82	50.19	17.04	53
54	51.36	16.69	51.28	16.91	51.21	17.13	51.13	17.36	54
55	52.31	17.00	52.23	17.22	52.16	17.45	52.08	17.68	55
56	53.26	17.30	53.18	17.54	53.11	17.77	53.03	18.00	56
57	54.21	17.61	54.13	17.85	54.05	18.08	53.98	18.32	57
58	55.16	17.92	55.08	18.16	55.00	18.40	54.92	18.64	58
59	56.11	18.23	56.03	18.48	55.95	18.72	55.87	18.96	59
60	57.06	18.54	56.98	18.79	56.90	19.04	56.82	19.29	60
61	58.01	18.85	57.94	19.10	57.85	19.35	57.76	19.61	61
62	58.97	19.16	58.89	19.42	58.80	19.67	58.71	19.93	62
63	59.92	19.47	59.84	19.73	59.74	19.99	59.66	20.25	63
64	60.87	19.78	60.79	20.04	60.69	20.31	60.60	20.57	64
65	61.82	20.09	61.74	20.36	61.64	20.62	61.55	20.89	65
66	62.77	20.39	62.69	20.67	62.59	20.94	62.50	21.21	66
67	63.72	20.70	63.64	20.98	63.54	21.26	63.44	21.54	67
68	64.67	21.01	64.59	21.29	64.49	21.58	64.39	21.86	68
69	65.62	21.32	65.54	21.61	65.43	21.89	65.34	22.18	69
70	66.57	21.63	66.48	21.92	66.38	22.21	66.28	22.50	70
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	72° 0′		71° 45′		71° 30′		71° 15′		

Dist.	19° 0'		19 15'		19° 30'		19° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.95	0.33	0.94	0.33	0.94	0.33	0.94	0.34	1
2	1.89	0.65	1.89	0.66	1.89	0,67	1.88	0.68	2
3	2.84	0.98	2.83	0.99	2.83	1.00	2.82	1.01	3
4	3.78	1.30	3.78	1.32	3.77	1.34	3.76	1.35	4
5	4.73	1.63	4.72	1.65	4.71	1.67	4.71	1.69	5
6	5,67	1.95	5.66	1.98	5.66	2.00	5.65	2.03	6
7	6.62	2.28	6.61	2.31	6.60	2.34	6.59	2.37	7
8	7.56	2.60	7.55	2.64	7.54	2.67	7.53	2.70	8
9	8.51	2.93	8.50	2,97	8.48	3.00	8.47	3.04	9
10	9.46	3.26	9.44	3.30	9.43	3.34	9.41	3.38	10
11	10.40	3.58	10.38	3.63	10.37	3.67	10.35	3.72	11
12	11.35	3.91	11.33	3.96	11.31	4.01	11.29	4.06	12
13	12.29	4.23	12.27	4.29	12.25	4.34	12.24	4.39	13
14	13.24	4.56	13.22	4.62	13.20	4,67	13.18	4.73	14
15	14.18	4.88	14.16	4.95	14.14	5.01	14.12	5.07	15
16	15.13	5.21	15.11	5.28	15,08	5.34	15.06	5.41	16
17	16.07	5.53	16.05	5.60	16.02	3.67	16.00	5.74	17
18	17.02	5.86	16.99	5.93	16.97	6.01	16.94	6.08	18
19	17.96	6.19	17.94	6,26	17.91	6.34	17.88	6.42	19
20	18.91	6.51	18.88	6.59	18.85	6.68	18.82	6.76	20
21	19.86	6.84	19.83	6.92	19.80	7.01	19.76	7.10	21
22	20.80	7.16	20.77	7.25	20.74	7.34	20.71	7.43	22
23	21.75	7.49	21.71	7.58	21.68	7.68	21.65	7.77	23
24	22.69	7.81	22.66	7.91	22.62	8.01	22.59	8.11	24
25	23.64	8.14	23.60	8.24	23.57	8.35	23.53	8.45	25
26	24.58	8.46	24.55	8.57	24,51	8.68	24.47	8.79	26
27	25.53	8.79	25.49	8.90	25.45	9.01	25.41	9.12	27
28	26.47	9.12	26.43	9.23	26.39	9.35	26.35	9.46	28
29	27.42	9.44	27.38	9.56	27.34	9.68	27.29	9.80	29
30	28.37	9.77	28.32	9.89	28.28	10.01	28.24	10.14	30
31	29.31	10.09	29.27	10.22	29.22	10.35	29.18	10.48	31
32	30.26	10.42	30,21	10.55	30.16	10.68	30.12	10.81	32
33	31.20	10.74	31.15	10.88	31.11	11.02	31.06	11.15	33
34	32.15	11,07	32.10	11.21	32.05	11.35	32.00	11.49	34
35	33,09	11.39	33.04	11.54	32.99	11.68	32.94	11.83	35
36	34.04	11.72	33.99	11.87	33.94	12.02	33.88	12.17	36
37	34.98	12.05	34.93	12.20	34.88	12.35	34.82	12.50	37
38	35.93	12.37	35.88	12.53	35.82	12.68	35.76	12.84	38
39	36.88	12.70	36.82	12.86	36.76	13.02	36.71	13.18	39
40	37.82	13.02	37.76	13.19	37.71	13.35	37.65	13.52	40
41	38.77	13.35	38.71	13.52	38.65	13.69	38.59	13.85	41
42	39.71	13.67	39.65	13.85	39.59	14.02	39.53	14.19	42
43	40.66	14.00	40.60	14.18	40.53	14.35	40.47	14.53	43
44	41.60	14.33	41.54	14.51	41.48	14.69	41.41	14.87	44
45	42.55	14,65	42.48	14.84	42.42	15.02	42.35	15.21	45
46	43.49	14.98	43.43	15.17	43.36	15.36	43.29	15.54	46
47	44.44	15.30	44.37	15.50	44.30	15.69	44.24	15.88	47
48	45.38	15.63	45.32	15.83	45.25	16.02	45,18	16.22	48
49	46.33	15.95	46.26	16.15	46.19	16.36	46.12	16.56	49
50	47.28	16.28	47.20	16.48	47.13	16.69	47.06	16.90	50
51	48.22	16.60	48.15	16.81	48.07	17.02	48.00	17.23	51
52	49.17	16.93	49.09	17.14	49,02	17.36	48.94	17.57	52
53	50.11	17.25	50.04	17.47	49.96	17.69	49.88	17.91	53
54	51.06	17.58	50.98	17.80	50.90	18.03	50.82	18.25	54
55	52.00	17.91	51.92	18.13	51.84	18.36	51.76	18.59	55
56	52.95	18.23	52.87	18.46	52.79	18.69	52.71	18.92	56
57	53.89	18.56	53.81	18.79	53.73	19.03	53.65	19.26	57
58	54.84	18.88	54.76	19.12	54.67	19.36	54.59	19.60	58
59	55.79	19.21	55.70	19.45	55.62	19.69	55.53	19.94	59
60	56.73	19.53	56.64	19.78	56,56	20.03	56.47	20.27	60
61	57.68	19.86	57.59	20.11	57.50	20.36	57.41	20.61	61
62	58.62	20.18	58.53	20.44	58.44	20.70	58.35	20.95	62
63	59.57	20.51	59.48	20.77	59.39	21.03	59.29	21.29	63
64	60.51	20.84	60.42	21.10	60.33	21.36	60.24	21.63	64
65	61.46	21.16	61.36	21.43	61.27	21.70	61,18	21.96	65
66	62.40	21.49	62.31	21.76	62.21	22.03	62,12	22.30	66
67	63.35	21.81	63.25	22.09	63.16	22.37	63.06	22.64	67
68	64.29	22.14	64.20	22.42	64.10	22.70	64.00	22.98	68
69	65.24	22.46	65.14	22.75	65.04	23.03	64.94	23.32	69
70	66.19	22.79	66.09	23.08	65.98	23.37	65.88	23.65	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dist.
	71° 0'		70° 45'		70° 30'		70° 15'		

Dist.	20° 0'		20° 15'		20° 30'		20° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.94	0.34	0.94	0.35	0.94	0.35	0.94	0.35	1
2	1.88	0.68	1.88	0.69	1.87	0.70	1.87	0.71	2
3	2.82	1.03	2.81	1.04	2.81	1.05	2.81	1.06	3
4	3.76	1.37	3.75	1.38	3.75	1.40	3.74	1.42	4
5	4.70	1.71	4.69	1.73	4.68	1.75	4.68	1.77	5
6	5.64	2.05	5.63	2.08	5.62	2.10	5.61	2.13	6
7	6.58	2.39	6.57	2.42	6.56	2.45	6.55	2.48	7
8	7.52	2.74	7.51	2.77	7.49	2.80	7.48	2.83	8
9	8.46	3.08	8.44	3.12	8.43	3.15	8.42	3.19	9
10	9.40	3.42	9.38	3.46	9.37	3.50	9.35	3.54	10
11	10.34	3.76	10.32	3.81	10.30	3.85	10.29	3.90	11
12	11.28	4.10	11.26	4.15	11.24	4.20	11.22	4.25	12
13	12.22	4.45	12.20	4.50	12.18	4.55	12.16	4.61	13
14	13.16	4.79	13.13	4.85	13.11	4.90	13.09	4.96	14
15	14.10	5.13	14.07	5.19	14.05	5.25	14.03	5.31	15
16	15.04	5.47	15.01	5.54	14.99	5.60	14.96	5.67	16
17	15.97	5.81	15.95	5.88	15.92	5.95	15.90	6.02	17
18	16.91	6.16	16.89	6.23	16.86	6.30	16.83	6.38	18
19	17.85	6.50	17.83	6.58	17.80	6.65	17.77	6.73	19
20	18.79	6.84	18.76	6.92	18.73	7.00	18.70	7.09	20
21	19.73	7.18	19.70	7.27	19.67	7.35	19.64	7.44	21
22	20.67	7.52	20.64	7.61	20.61	7.70	20.57	7.79	22
23	21.61	7.87	21.58	7.96	21.54	8.05	21.51	8.15	23
24	22.55	8.21	22.52	8.31	22.48	8.41	22.44	8.50	24
25	23.49	8.55	23.45	8.65	23.42	8.76	23.38	8.86	25
26	24.43	8.89	24.39	9.00	24.35	9.11	24.31	9.21	26
27	25.37	9.23	25.33	9.35	25.29	9.46	25.25	9.57	27
28	26.31	9.58	26.27	9.69	26.23	9.81	26.18	9.92	28
29	27.25	9.92	27.21	10.04	27.16	10.16	27.12	10.27	29
30	28.19	10.26	28.15	10.38	28.10	10.51	28.05	10.63	30
31	29.13	10.60	29.08	10.73	29.04	10.86	28.99	10.98	31
32	30.07	10.94	30.02	11.08	29.97	11.21	29.92	11.34	32
33	31.01	11.29	30.96	11.42	30.91	11.56	30.86	11.69	33
34	31.95	11.63	31.90	11.77	31.85	11.91	31.79	12.05	34
35	32.89	11.97	32.84	12.11	32.78	12.26	32.73	12.40	35
36	33.83	12.31	33.77	12.46	33.72	12.61	33.67	12.75	36
37	34.77	12.65	34.71	12.81	34.66	12.96	34.60	13.11	37
38	35.71	13.00	35.65	13.15	35.59	13.31	35.54	13.46	38
39	36.65	13.34	36.59	13.50	36.53	13.66	36.47	13.82	39
40	37.59	13.68	37.53	13.84	37.47	14.01	37.41	14.17	40
41	38.53	14.02	38.47	14.19	38.40	14.36	38.34	14.53	41
42	39.47	14.36	39.40	14.54	39.34	14.71	39.28	14.88	42
43	40.41	14.71	40.34	14.88	40.28	15.06	40.21	15.23	43
44	41.35	15.05	41.28	15.23	41.21	15.41	41.15	15.59	44
45	42.29	15.39	42.22	15.58	42.15	15.76	42.08	15.94	45
46	43.23	15.73	43.16	15.92	43.09	16.11	43.02	16.30	46
47	44.17	16.07	44.09	16.27	44.02	16.46	43.95	16.65	47
48	45.11	16.42	45.03	16.61	44.96	16.81	44.89	17.01	48
49	46.04	16.76	45.97	16.96	45.90	17.16	45.82	17.36	49
50	46.98	17.10	46.91	17.31	46.83	17.51	46.76	17.71	50
51	47.93	17.44	47.85	17.65	47.77	17.86	47.69	18.07	51
52	48.86	17.79	48.79	18.00	48.71	18.21	48.63	18.42	52
53	49.80	18.13	49.73	18.34	49.64	18.56	49.56	18.78	53
54	50.74	18.47	50.66	18.69	50.58	18.91	50.50	19.13	54
65	51.68	18.81	51.60	19.04	51.52	19.26	51.43	19.49	55
56	52.62	19.15	52.54	19.38	52.45	19.61	52.37	19.84	56
57	53.56	19.50	53.48	19.73	53.59	19.96	53.30	20.20	57
58	54.50	19.84	54.42	20.08	54.33	20.31	54.24	20.55	58
59	55.44	20.18	55.35	20.42	55.26	20.66	55.17	20.90	59
60	56.38	20.52	56.29	20.77	56.20	21.01	56.11	21.26	60
61	57.32	20.86	57.23	21.11	57.14	21.36	57.04	21.61	61
62	58.26	21.21	58.17	21.46	58.07	21.71	57.98	21.97	62
63	59.20	21.55	59.11	21.81	59.01	22.06	58.91	22.32	63
64	60.14	21.89	60.04	22.15	59.95	22.41	59.85	22.67	64
65	61.08	22.23	60.98	22.50	60.88	22.76	60.79	23.03	65
66	62.02	22.57	61.92	22.84	61.82	23.11	61.72	23.38	66
67	62.96	22.92	62.86	23.19	62.76	23.46	62.66	23.74	67
68	63.90	23.26	63.80	23.54	63.69	23.82	63.59	24.09	68
69	64.84	23.60	64.74	23.88	64.63	24.16	64.53	24.45	69
70	65.78	23.94	65.67	24.23	65.57	24.51	65.46	24.80	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	70° 0'		69° 45'		69° 30'		69° 15'		

Dist.	21° 0'		21° 15'		21° 30'		21° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.93	0.36	0.93	0.36	0.93	0.37	0.93	0.37	1
2	1.87	0.72	1.86	0.72	1.86	0.73	1.86	0.74	2
3	2.80	1.08	2.80	1.09	2.79	1.10	2.79	1.11	3
4	3.73	1.43	3.73	1.45	3.72	1.47	3.72	1.48	4
5	4.67	1.79	4.66	1.81	4.65	1.83	4.64	1.85	5
6	5.60	2.15	5.59	2.17	5.58	2.20	5.57	2.22	6
7	6.54	2.51	6.52	2.54	6.51	2.57	6.50	2.59	7
8	7.47	2.87	7.46	2.90	7.44	2.93	7.43	2.96	8
9	8.40	3.23	8.39	3.26	8.37	3.30	8.36	3.34	9
10	9.34	3.58	9.32	3.62	9.30	3.67	9.29	3.71	10
11	10.27	3.94	10.25	3.99	10.23	4.03	10.22	4.08	11
12	11.20	4.30	11.18	4.35	11.17	4.40	11.15	4.45	12
13	12.14	4.66	12.12	4.71	12.10	4.76	12.07	4.82	13
14	13.07	5.02	13.05	5.07	13.03	5.13	13.00	5.19	14
15	14.00	5.38	13.98	5.44	13.96	5.50	13.93	5.56	15
16	14,94	5.73	14.91	5.80	14.89	5.86	14.86	5.93	16
17	15.87	6.09	15.84	6.16	15.82	6.23	15.79	6.30	17
18	16.80	6.45	16.78	6.52	16.75	6.60	16.72	6.67	18
19	17.74	6.81	17.71	6.89	17.68	6.96	17.65	7.04	19
20	18.67	7.17	18.64	7.25	18.61	7.33	18.58	7.41	20
21	19.61	7,53	19.57	7.61	19.54	7.70	19.51	7.78	21
22	20.54	7.87	20.50	7.97	20.47	8.06	20.43	8.15	22
23	21.47	8.24	21.44	8.34	21.40	8.43	21.36	8.52	23
24	22.41	8.60	22.37	8.70	22.33	8.80	22.29	8.89	24
25	23.34	8.96	23.30	9.06	23.26	9.16	23.22	9.26	25
26	24.27	9.32	24.23	9.42	24.19	9.53	24.15	9.63	26
27	25.21	9.68	25.16	9.79	25.12	9.90	25.08	10.01	27
28	26.14	10.03	26.10	10.15	26.05	10.26	26.01	10.38	28
29	27,07	10.39	27.03	10.51	26.98	10.63	26.94	10.75	29
30	28.01	10.75	27.96	10.87	27.91	11.00	27.86	11.12	30
31	28.94	11.11	28.89	11.24	28.84	11.36	28.79	11.49	31
32	29.87	11.47	29.82	11.60	29.77	11.73	29.72	11.86	32
33	30.81	11.83	30.76	11.96	30.70	12.09	30.65	12.23	33
34	31.74	12.18	31.69	12.32	31.63	12.46	31.58	12.60	34
35	32.68	12.54	32.62	12.69	32.56	12.83	32.51	12.97	35
36	33.61	12,90	33.55	13.05	33.50	13.19	33.44	13.34	36
37	34.54	13.26	34.48	13.41	34.43	13.56	34.37	13.71	37
38	35.48	13.62	35.42	13.77	35,36	13.93	35.29	14.08	38
39	36.41	13.98	36.35	14,14	36.29	14.29	36.22	14.45	39
40	37.34	14.33	37.28	14.50	37.22	14.66	37.15	14.82	40
41	38.28	14.69	38.21	14.86	38.15	15.03	38.08	15.19	41
42	39.21	15.05	39.14	15.22	39.08	15.39	39.01	15.56	42
43	40.14	15.41	40.08	15.58	40.01	15.76	39.94	15.93	43
44	41,08	15.77	41.01	15.95	40.94	16.13	40.87	16.30	44
45	42.01	16.13	41.94	16.31	41.87	16.49	41.80	16.68	45
46	42.94	16.49	42.87	16.67	42.80	16.86	42.73	17.05	46
47	43.88	16.84	43.80	17.03	43.73	17.23	43.65	17.42	47
48	44.81	17.20	44.74	17.40	44.66	17.59	44.58	17.79	48
49	45.75	17.56	45.67	17.76	45.59	17.96	45.51	18.16	49
50	46.68	17.92	46.60	18.12	46.52	18.33	46.44	18.53	50
51	47.61	18.28	47.53	18.48	47.45	18.69	47.37	18.90	51
52	48.54	18.64	48.47	18.85	48.38	19.06	48.30	19.27	52
53	49.48	18.99	49.40	19,21	49.31	19.43	49.23	19,64	53
54	50.41	19.35	50.33	19.57	50.24	19.79	50.16	20.01	54
55	51.35	19.71	51.26	19.94	51.17	20.16	51.09	20.38	55
56	52.28	20.07	52.19	20.30	52,10	20.52	52.01	20.75	56
57	53.21	20.43	53.13	20.66	53.03	20.89	52.94	21.12	57
58	54.15	20.79	54.06	21.02	53.96	21.26	53.87	21.49	58
59	55.08	21.14	54.99	21.38	54.90	21.62	54.80	21.86	59
60	56.02	21.50	55.92	21.75	55.83	21,99	55.73	22.23	60
61	56.95	21.86	56.85	22.11	56.76	22.36	56.66	22.60	61
62	57.88	22.22	57.79	22.47	57.69	22.73	57.59	22.98	62
63	58.82	22.58	58.72	22.83	58.62	23.09	58.52	23.35	63
64	59.75	22.94	59.65	23.20	59.55	23.46	59.44	23.72	64
65	60.68	23.29	60.58	23.56	60.48	23.82	60.37	24.09	65
66	61.62	23.65	61.51	23.92	61.41	24.19	61.30	24.46	66
67	62.55	24.01	62.45	24.28	62.34	24.56	62.23	24.83	67
68	63.48	24.37	63.38	24.65	63.27	24.92	63.16	25.20	68
69	64.42	24.73	64.31	25.01	64.20	25.29	64.09	25.57	69
70	65.35	25.09	65.24	25.37	65.13	25.66	65.02	25.94	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	69° 0'		68° 45'		68° 30'		68° 15'		

Dist.	22° 0'		22° 15'		22° 30'		22° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.93	0.37	0.93	0.38	0,92	0.38	0.92	0.39	1
2	1.85	0.75	1.85	0.76	1.85	0.77	1.84	0.77	2
3	2.78	1.12	2.78	1.14	2.77	1.15	2.77	1.16	3
4	3.71	1.50	3.70	1.51	3.70	1.53	3.69	1.55	4
5	4.64	1.87	4.63	1.89	4.62	1.91	4.61	1.93	5
6	5.56	2.25	5.55	2.27	5.54	2.30	5.53	2.32	6
7	6.49	2.62	6.48	2.65	6.47	2.68	6.46	2.71	7
8	7.42	3.00	7.40	3.03	7.39	3.06	7.38	3.09	8
9	8.34	3.37	8.33	3.41	8.31	3.44	8.30	3.48	9
10	9.27	3.75	9.26	3.79	9.24	3.83	9.22	3.87	10
11	10.20	4.12	10.18	4.17	10.16	4.21	10.14	4.25	11
12	11.13	4.50	11.11	4.54	11.09	4.59	11.07	4.64	12
13	12.05	4.87	12.03	4.92	12.01	4.97	11.99	5.03	13
14	12.98	5.24	12.96	5.30	12.93	5.36	12.91	5.41	14
15	13.91	5.62	13.88	5.68	13.86	5.74	13.83	5.80	15
16	14.83	5.99	14.81	6.06	14.78	6.12	14.76	6.19	16
17	15.76	6.37	15.73	6.44	15.71	6.51	15.68	6.57	17
18	16.69	6.74	16.66	6.82	16.63	6.89	16.60	6.96	18
19	17.62	7.12	17.59	7.19	17.55	7.27	17.52	7.35	19
20	18.54	7.49	18.51	7.57	18.48	7.65	18.44	7.73	20
21	19.47	7.87	19.44	7.95	19.40	8.04	19.37	8.12	21
22	20.40	8.24	20.36	8.33	20.33	8.42	20.29	8.51	22
23	21.33	8.62	21.29	8.71	21.25	8.80	21.21	8.89	23
24	22.25	8.99	22.21	9.09	22.17	9.18	22.13	9.28	24
25	23.18	9.37	23.14	9.47	23.10	9.57	23.06	9.67	25
26	24.11	9.74	24.06	9.84	24.02	9.95	23.98	10.05	26
27	25.03	10.11	24.99	10.22	24.94	10.33	24.90	10.44	27
28	25.96	10.49	25.92	10.60	25.87	10.72	25.82	10.83	28
29	26.89	10.86	26.84	10.98	26.79	11.10	26.74	11.21	29
30	27.82	11.24	27.77	11.36	27.72	11.48	27.67	11.60	30
31	28.74	11.61	28.69	11.74	28.64	11.86	28.59	11.99	31
32	29.67	11.99	29.62	12.12	29.56	12.25	29.51	12.37	32
33	30.60	12.36	30.54	12.50	30,49	12.63	30.43	12.76	33
34	31.52	12.74	31.47	12.87	31.41	13.01	31.35	13.15	34
35	32.45	13.11	32.39	13.25	32.34	13.39	32.28	13.53	35
36	33.38	13.49	33.32	13.63	33.26	13.78	33.20	13.92	36
37	34.31	13.86	34.24	14.01	34.18	14.16	34.12	14.31	37
38	35.23	14.24	35.17	14.39	35.11	14.54	35.04	14.69	38
39	36.16	14.61	36.10	14.77	36.03	14.92	35.97	15.08	39
40	37.09	14.98	37.02	15.15	36.96	15.31	36.89	15.47	40
41	38.01	15.36	37.95	15.52	37.88	15.69	37.81	15.86	41
42	38.94	15.73	38.87	15.90	38.80	16.07	38.73	16.24	42
43	39.87	16.11	39.80	16.28	39.73	16.46	39.65	16.63	43
44	40.80	16.48	40.72	16.66	40.65	16.84	40.58	17.02	44
45	41.72	16.86	41.65	17.04	41.57	17.22	41.50	17.40	45
46	42.65	17.23	42.57	17.42	42.50	17.60	42.42	17.79	46
47	43.58	17.61	43.50	17.80	43.42	17.99	43.34	18.18	47
48	44.50	17.98	44.43	18.18	44.35	18.37	44.27	18.56	48
49	45.43	18.36	45.35	18.55	45.27	18.75	45.19	18.95	49
50	46.36	18.73	46.28	18.93	46.19	19.13	46.11	19.34	50
51	47.29	19.11	47.20	19.31	47.12	19.52	47.03	19.72	51
52	48.21	19.48	48.13	19.69	48.04	19.90	47.95	20.11	52
53	49.14	19.86	49.05	20.07	48.97	20.28	48.88	20.50	53
54	50.07	20.23	49.98	20.45	49.89	20.66	49.80	20.88	54
55	51.00	20.60	50.90	20.83	50.81	21.05	50.72	21.27	55
56	51.92	20.98	51.83	21.20	51.74	21.43	51.64	21,66	56
57	52.85	21.35	52.76	21.58	52.65	21.81	52.57	22.04	57
58	53.78	21.73	53.68	21.96	53.59	22.20	53.49	22.43	58
59	54.70	22.10	54.61	22.34	54.51	22.58	54.41	22.82	59
60	55.63	22.48	55.53	22.72	55.43	22.96	55.32	23.20	60
61	56.56	22.85	56.46	23.10	56.36	23.34	56.25	23.59	61
62	57.49	23.23	57.38	23.48	57.28	23.73	57.18	23.98	62
63	58.41	23.60	58.31	23.86	58.21	24.11	58.10	24.37	63
64	59.34	23.98	59.23	24.23	59.13	24.49	59.02	24.75	64
65	60.27	24.35	60.16	24.61	60.05	24.87	59.94	25.14	65
66	61.19	24.72	61.08	24.99	60.98	25.26	60.87	25.52	66
67	62.12	25.10	62.01	25.37	61.90	25.63	61.79	25.91	67
68	63.05	25.47	62.94	25.75	62.82	26.02	62.71	26.30	68
69	63.98	25.85	63.86	26.13	63.75	26.41	63.63	26.68	69
70	64.90	26.22	64.79	26.51	64.67	26.79	64.55	27.07	70
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dist.
	68° 0'		67° 45'		67° 30'		67° 15'		

Dist.	23° 0′		23° 15′		23° 30′		23° 45′		Dist.
	Lat	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	
1	0.92	0.39	0.92	0.39	0,92	0.40	0.92	0.40	1
2	1.84	0.78	1.84	0.79	1.83	0.80	1.83	0.81	2
3	2.76	1.17	2.76	1.18	2.75	1.20	2.75	1.21	3
4	3.68	1.56	3.68	1.58	3.67	1.60	3.66	1.61	4
5	4.60	1.95	4.59	1.97	4.59	1.99	4.58	2.01	5
6	5.52	2.34	5.51	2.37	5.50	2.39	5.49	2.42	6
7	6.44	2.74	6.43	2.76	6.42	2.79	6.41	2.82	7
8	7.36	3.13	7.35	3.16	7.34	3.19	7.32	3.22	8
9	8.28	3.52	8.27	3.55	8.25	3.59	8.24	3.62	9
10	9.21	3.91	9.19	3.95	9.17	3.99	9.15	4.03	10
11	10.13	4.30	10.11	4.34	10.09	4.39	10.07	4.43	11
12	11.05	4.69	11.03	4.74	11.00	4.79	10.98	4.83	12
13	11.97	5.08	11.94	5.13	11.92	5.18	11.90	5.24	13
14	12.89	5.47	12.86	5.53	12.84	5.58	12.81	5.64	14
15	13.81	5.86	13.78	5.92	13.76	5.98	13.73	6.04	15
16	14.73	6.25	14.70	6.32	14,67	6.38	14.64	6.44	16
17	15.65	6.64	15.62	6.71	15.59	6.78	15.56	6.85	17
18	16.57	7.03	16.54	7.11	16.51	7.18	16.48	7.25	18
19	17.49	7.42	17.46	7.50	17.42	7.58	17.39	7.65	19
20	18.41	7.81	18.38	7.89	18.34	7.98	18.31	8.06	20
21	19.33	8.21	19.29	8.29	19.26	8.37	19.22	8.46	21
22	20.25	8.60	20.21	8.68	20.18	8.77	20.14	8.86	22
23	21.17	8.99	21.13	9.08	21.09	9.17	21.05	9.26	23
24	22.09	9.38	22.05	9.47	22.01	9.57	21.97	9.67	24
25	23.01	9.77	22.97	9.87	22.93	9.97	22.88	10.07	25
26	23.93	10.16	23.89	10.26	23.84	10.37	23.80	10.47	26
27	24.85	10.55	24.81	10.66	24.76	10.77	24.71	10.87	27
28	25.77	10.94	25.73	11.05	25.68	11.16	25.63	11.28	28
29	26.69	11.33	26.64	11.45	26.59	11.56	26.54	11.68	29
30	27.62	11.72	27.56	11.84	27.51	11.96	27.46	12.09	30
31	28.54	12.11	28.48	12.24	28.43	12.36	28.37	12.49	31
32	29.46	12.50	29.40	12.63	29.35	12.76	29.29	12.89	32
33	30.38	12.89	30.32	13.03	30,26	13.16	30.21	13.29	33
34	31.30	13.28	31.24	13.42	31.18	13.56	31.12	13.69	34
35	32.22	13.68	32.16	13.82	32.10	13.96	32.04	14.10	35
36	33.14	14.07	33.08	14.21	33.01	14.36	32.95	14.50	36
37	34.06	14.46	34.00	14.61	33.93	14.75	33.87	14.90	37
38	34.98	14.85	34.91	15.00	34.85	15.15	34.78	15.30	38
39	35.90	15.24	35.83	15.39	35.77	15.55	35.70	15.71	39
40	36.82	15.63	36.75	15.79	36.68	15.95	36.61	16.11	40
41	37.74	16.02	37.67	16.18	37.60	16.35	37.53	16.51	41
42	38.66	16.41	38.59	16.58	38.52	16.75	38.44	16.92	42
43	39.58	16.80	39.51	16.97	39.43	17.15	39.36	17.32	43
44	40.50	17.19	40.43	17.37	40.35	17.54	40.27	17.72	44
45	41.42	17.58	41.35	17.76	41.27	17.94	41.19	18.12	45
46	42.34	17.97	42.26	18.16	42.18	18.34	42.10	18.53	46
47	43.26	18.36	43.18	18.55	43.10	18.74	43.02	18.93	47
48	44.18	18.76	44.10	18.95	44.02	19.14	43.93	19.33	48
49	45.10	19.15	45.02	19,34	44.94	19.54	44.85	19.73	49
50	46.03	19.54	45.94	19.74	45.85	19.94	45.77	20.14	50
51	46.95	19.93	46.86	20.13	46.77	20.34	46.68	20.54	51
52	47.87	20.32	47.78	20.53	47.69	20.74	47.60	20.94	52
53	48.79	20.71	48.70	20.92	48.60	21.13	48.51	21,35	53
54	49.71	21.10	49.62	21.32	49.52	21.53	49.43	21.75	54
55	50.63	21.49	50.53	21.71	50.44	21.93	50.34	22.15	55
56	51.55	21.88	51.45	22.11	51.36	22.33	51.26	22.55	56
57	52.46	22.27	52.37	22.50	52.27	22.73	52.17	22.96	57
58	53.39	22.66	53.29	22.90	53.19	23.13	53.09	23.36	58
59	54.31	23.05	54.21	23.29	54.11	23.53	54.00	23.76	59
60	55.23	23.44	55.13	23.68	55.02	23,93	54.92	24.17	60
61	56.15	23.83	56.05	24.08	55.94	24.32	55.83	24.57	61
62	57.07	24.22	56.97	24.47	56.86	24.72	56.75	24.97	62
63	57.99	24.62	57.88	24.87	57.78	25.12	57.66	25.37	63
64	58.91	25.01	58.80	25.26	58.69	25.52	58.58	25.78	64
65	59.83	25.40	59.72	25.66	59.61	25.92	59.49	26.18	65
66	60.75	25.79	60.64	26.05	60.53	26.32	60.41	26.58	66
67	61.67	26.18	61,56	26.45	61.44	26.72	61.32	26.99	67
68	62.59	26.57	62.48	26.84	62.36	27.12	62.24	27.39	68
69	63.52	26.96	63.40	27.23	63.28	27.52	63.15	27.79	69
70	64.44	27.35	64.32	27.63	64.19	27.91	64.07	28,19	70
Dist.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dep	Lat.	Dist.
	67° 0′		66° 45′		66° 30′		66° 15′		

Dist.	24° 0′		24° 15′		24° 30′		24° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	
1	0.91	0.41	0.91	0.41	0.91	0.41	0.91	0.42	1
2	1.83	0.81	1.62	0.82	1.82	0.83	1.82	0.84	2
3	2.74	1.22	2.74	1.23	2.73	1.24	2.72	1.26	3
4	3.65	1.63	3.65	1.64	3.64	1.66	3.63	1.67	4
5	4.57	2.03	4.56	2.05	4.55	2.07	4.54	2.09	5
6	5.48	2.44	5.47	2.46	5.46	2.49	5.45	2.51	6
7	6.39	2.85	6.38	2.88	6.37	2.90	6.36	2.93	7
8	7.31	3.25	7.29	3.29	7.27	3.32	7.27	3.35	8
9	8.22	3.66	8.21	3.70	8.19	3.73	8.17	3.77	9
10	9.14	4.07	9.12	4.11	9.10	4.15	9.08	4.19	10
11	10.05	4.47	10.03	4.52	10.01	4.56	9.99	4.61	11
12	10.96	4.88	10.94	4.93	10.92	4.98	10.90	5.02	12
13	11.88	5.29	11.85	5.34	11.83	5.39	11.81	5.44	13
14	12.79	5.69	12.76	5.75	12.73	5.81	12.71	5.86	14
15	13.70	6.10	13.68	6.16	13.64	6.22	13.62	6.28	15
16	14,62	6.51	14.59	6.57	14.56	6.64	14.53	6.70	16
17	15.53	6.91	15.50	6.98	15.47	7.05	15.44	7.12	17
18	16.44	7.32	16.41	7.39	16.38	7.46	16.35	7.54	18
19	17.36	7,73	17.32	7.80	17.29	7.88	17.25	7.95	19
20	18.27	8.13	18.24	8.21	18.20	8.29	18.16	8.37	20
21	19.18	8.54	19.15	8.63	19.11	8.71	19.07	8.79	21
22	20.10	8.95	20.06	9.04	20.02	9.12	19.98	9.21	22
23	21.01	9.36	20.97	9.45	20.93	9.54	20.89	9.63	23
24	21.93	9.76	21.88	9.86	21.84	9.96	21.80	10.05	24
25	22.84	10.17	22.79	10.27	22.75	10.37	22.70	10.47	25
26	23.75	10.58	23.71	10.68	23.66	10.78	23.61	10.89	26
27	24.67	10.98	24.62	11.09	24.57	11.20	24.52	11.30	27
28	25.58	11.39	25.53	11.50	25.48	11.61	25.43	11.72	28
29	26.49	11.80	26.44	11.91	26.39	12.03	26.34	12.14	29
30	27.41	12.20	27.35	12.32	27.30	12.44	27.24	12.56	30
31	28.32	12.61	28.26	12.73	28.21	12.86	28.15	12.98	31
32	29.23	13.02	29.18	13.14	29.12	13.27	29.06	13.40	32
33	30.15	13.42	30.09	13.55	30.03	13.68	29.97	13.82	33
34	31.06	13.83	31.00	13.96	30.94	14.10	30.88	14.23	34
35	31.97	14,24	31.91	14.38	31.85	14.51	31.78	14.65	35
36	32.89	14.64	32.82	14.79	32.76	14.93	32,69	15.07	36
37	33.80	15.05	33.74	15.20	33.67	15.34	33.60	15.49	37
38	34.71	15.46	34.65	15.61	34.58	15.76	34.51	15.91	38
39	35.63	15.86	35.56	16.02	35.49	16.17	35.42	16.33	39
40	36.54	16.27	36.47	16.43	36,40	16.59	36.33	16.75	40
41	37.46	16.68	37.38	16.84	37.31	17.00	37.23	17.17	41
42	38.37	17.08	38.29	17,25	38.22	17.42	38.14	17.58	42
43	39.28	17.49	39.21	17.66	39.13	17.83	39.05	18.00	43
44	40.20	17.90	40.12	18.07	40.04	18.25	39.96	18.42	44
45	41,11	18.30	41.03	18.48	40.95	18.66	40.87	18.84	45
46	42.02	18.71	41,94	18.89	41.86	19.08	41.77	19.26	46
47	42.94	19.12	42.85	19.30	42.77	19.49	42.68	19,68	47
48	43.85	19.52	43.76	19.71	43.68	19.91	43.59	20.10	48
49	44.76	19.93	44.68	20.13	44.59	20.32	44.50	20.52	49
50	45.68	20.34	45.59	20.54	45.50	20.73	45.41	20.93	50
51	46.59	20.74	46.50	20.95	46.41	21,15	46.32	21.35	51
52	47.51	21.15	47.41	21,36	47.32	21.57	47.22	21.77	52
53	48.42	21.56	48.32	21.77	48.23	21.98	48.13	22.19	53
54	49.33	21.96	49.23	22.18	49.14	22.40	49.04	22.61	54
55	50.25	22.37	50.15	22.59	50.05	22.81	49.95	23.03	55
56	51.16	22.78	51.06	23.00	50.96	23.23	50.86	23.45	56
57	52.07	23.18	51.97	23.41	51.87	23.64	51.76	23.87	57
58	52.98	23.59	52.88	23.82	52,78	24.06	52.68	24.29	58
59	53.90	24.00	53.79	24.23	53.69	24.47	53.58	24.70	59
60	54.81	24.40	54.71	24.64	54.60	24.88	54.49	25.12	60
61	55.73	24.81	55.62	25.06	55.51	25.30	55.40	25.54	61
62	56.64	25.22	56.53	25.47	56,42	25.71	56.30	25.96	62
63	57.56	25.63	57.44	25.88	57.33	26.13	57.21	26.38	63
64	58.47	26,03	58.35	26.29	58.24	26,54	58.12	26.80	64
65	59.38	26.44	59.27	26.70	59.15	26.96	59.03	27.22	65
66	60.30	26.85	60.18	27.11	60.06	27.37	59.94	27.63	66
67	61.21	27.26	61.09	27.52	60.97	27,79	60.84	28.05	67
68	62.13	27.66	62.00	27.93	61.88	28.20	61.75	28.47	68
69	63.04	28.07	62.91	28.34	62.79	28.62	62.66	28.89	69
70	63.95	28.47	63.82	28.75	63.70	29.03	63.57	29.31	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	66°	0′	65°	45′	65°	30	65°	15′	

Dist.	25° 0′		25° 15′		25° 30′		25° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.91	0.42	0 90	0.43	0.90	0.43	0.90	0.43	1
2	1.81	0.85	1.81	0.85	1.81	0.86	1.80	0.87	2
3	2.72	1.27	2.71	1.28	2 71	1.29	2.70	1.30	3
4	3.63	1.69	3.62	1.71	3.61	1.72	3.60	1.74	4
5	4.53	2.11	4.52	2.13	4.51	2.15	4.50	2.17	5
6	5.44	2.54	5.43	2.56	5.42	2.58	5.40	2.61	6
7	6.34	2.96	6.33	2.99	6.32	3.01	6.30	3.04	7
8	7.25	3.38	7.24	3.41	7.22	3.44	7.21	3.48	8
9	8.16	3.80	8.14	3 84	8 12	3.87	8.11	3.91	9
10	9.06	4.23	9.04	4.27	9.03	4.31	9.01	4.34	10
11	9.97	4.65	9.95	4.69	9.93	4.74	9.91	4.78	11
12	10.88	5.07	10.85	5.12	10.83	5.17	10.81	5.21	12
13	11.78	5.49	11.76	5.55	11.73	5.60	11.71	5.65	13
14	12.69	5.92	12.66	5.97	12.64	6.03	12.61	6.08	14
15	13.59	6.34	13.57	6.40	13.54	6.46	13.51	6.52	15
16	14.50	6.76	14.47	6.83	14.44	6.89	14.41	6.95	16
17	15.41	7.18	15.38	7.25	15.34	7.32	15.31	7.39	17
18	16.31	7.61	16.28	7.68	16.25	7.75	16.21	7.82	18
19	17.22	8.03	17.18	8.10	17.15	8.18	17.11	8.25	19
20	18.13	8 45	18 09	8.53	18.05	8.61	18.01	8.69	20
21	19.03	8.88	18 99	8.96	18.95	9.04	18.91	9.12	21
22	19.94	9.30	19.90	9.38	19 86	9.47	19.82	9.56	22
23	20.85	9.72	20.80	9.81	20.76	9.90	20.72	9.99	23
24	21.75	10.14	21.71	10.24	21.66	10.33	21.62	10.43	24
25	22.66	10.57	22.61	10.66	22.56	10.76	22.52	10.86	25
26	23.56	10.99	23.52	11.09	23.47	11.19	23.42	11.30	26
27	24.47	11.41	24.42	11.52	24.37	11.62	24.32	11.73	27
28	25.38	11.83	25.32	11.94	25.27	12.05	25.22	12.16	28
29	26.28	12.26	26.23	12.37	26.18	12.48	26.12	12.60	29
30	27.19	12.68	27.13	12.80	27.08	12.92	27.02	13.03	30
31	28.10	13.10	28.04	13.22	27 98	13.35	27.92	13.47	31
32	29.00	13.52	28.94	13.65	28.88	13.78	28.82	13.90	32
33	29.91	13.95	29.85	14.08	29.79	14.21	29.72	14.34	33
34	30.81	14.37	30.75	14.50	30.69	14.64	30.62	14.77	34
35	31.72	14.79	31.66	14.93	31.59	15.07	31.52	15.21	35
36	32.63	15.21	32.56	15.36	32.49	15.50	32.43	15.64	36
37	33.53	15.64	33.47	15.78	33.40	15.93	33.33	16.07	37
38	34.44	16.06	34.37	16.21	34.30	16.36	34.23	16.51	38
39	35.35	16.48	35.27	16.64	35.20	16.79	35.13	16.94	39
40	36.25	16.90	36.18	17.06	36.10	17.22	36.03	17 38	40
41	37.16	17.33	37.08	17.49	37.01	17.65	36.93	17.81	41
42	38.07	17.76	37.99	17.92	37.91	18.08	37.83	18.25	42
43	38.97	18.17	38.89	18.34	38.81	18.51	38.73	18.68	43
44	39.88	18.60	39 80	18.77	39.71	18.94	39.63	19.12	44
45	40.78	19.02	40.70	19.20	40.62	19.37	40.53	19.55	45
46	41.69	19.44	41.61	19.62	41.52	19 80	41.43	19.98	46
47	42.60	19.86	42.51	20 05	42.42	20.23	42.33	20.42	47
48	43.50	20.29	43.41	20.48	43.32	20.66	43.23	20.85	48
49	44.41	20.71	44.32	20.90	44.23	21.09	44.13	21.29	49
50	45.32	21.13	45.22	21.33	45.13	21.53	45.03	21.72	50
51	46.22	21.55	46.13	21.76	46.03	21.96	45.94	22.16	51
52	47.13	21.98	47.03	22.18	46.94	22.39	46.84	22.59	52
53	48.03	22.40	47.94	22.61	47.84	22.82	47.74	23.03	53
54	48.95	22.82	48 84	23.04	48.74	23.25	48.64	23.46	54
55	49.85	23.24	49.74	23.46	49.65	23.68	49.54	23.90	55
56	50.75	23.67	50.65	23.89	50.55	24.11	50.44	24.33	56
57	51 66	24.09	51.55	24.32	51.45	24.54	51.34	24.77	57
58	52 56	24.52	52.45	24.75	52.35	24.97	52.24	25.20	58
59	53.47	24.94	53 36	25.17	53.26	25.41	53.14	25.63	59
60	54 38	25 36	54.27	25.59	54.16	25.83	54.04	26 07	60
61	55.29	25.78	55.17	26.02	55.06	26.26	54.94	26.51	61
62	56.19	26.20	56.08	26.45	55.96	26.69	55 84	26.94	62
63	57.10	26.63	56.98	26.88	56.86	27.12	56.75	27.37	63
64	58.00	27.05	57.88	27 30	57,77	27.56	57.65	27.80	64
65	58.91	27.47	58.79	27.73	58.67	27.99	58.55	28.24	65
66	59.82	27.90	59.69	28 16	59.57	28.42	59.45	28.67	66
67	60.72	28.32	60.60	28.58	60.48	28.85	60.35	29.11	67
68	61.63	28.74	61.50	29.01	61.38	29.27	61.25	29.54	68
69	62.53	29.16	62.40	29.44	62.28	29.71	62.15	29.97	69
70	63.44	29.58	63.31	29.86	63.18	30.14	63.05	30.41	70
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	65° 0′		64° 45′		64° 30′		64° 15′		

Dist.	°26 0′		26° 15′		°26 30′		26° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.90	0.44	0.90	0.44	0.89	0.45	0.89	0.45	1
2	1.80	0.88	1.79	0.88	1.79	0.89	1.79	0.90	2
3	2.70	1.32	2.69	1.33	2.68	1.34	2.68	1.35	3
4	3.60	1.75	3.59	1.77	3.58	1.78	3.57	1.80	4
5	4.49	2.19	4.48	2.21	4.47	2.23	4.46	2.25	5
6	5.39	2.63	5.38	2.65	5.37	2.68	5.36	2.70	6
7	6.29	3.07	6.28	3.10	6.26	3.12	6.25	3.15	7
8	7.19	3.51	7.17	3.54	7.16	3.57	7.14	3.60	8
9	8.09	3.95	8.07	3.98	8.06	4.02	8.04	4.05	9
10	8.99	4.38	8.97	4.42	8.95	4.46	8.93	4.50	10
11	9.89	4.82	9.87	4.87	9.84	4.91	9.82	4.95	11
12	10.79	5.26	10.76	5.31	10.74	5.35	10.72	5.40	12
13	11.68	5.70	11.66	5.75	11.63	5.80	11.61	5.85	13
14	12.58	6.14	12.56	6.19	12.53	6.25	12.50	6.30	14
15	13.48	6.58	13.45	6.63	13.42	6.69	13.39	6.75	15
16	14.38	7.01	14.35	7.08	14.32	7.14	14.29	7.20	16
17	15.28	7.45	15.25	7.52	15.21	7.59	15.18	7.65	17
18	16.18	7.89	16.14	7.96	16.11	8.03	16.07	8.10	18
19	17.08	8.33	17.04	8.40	17.00	8.48	16.97	8.56	19
20	17.98	8.77	17.94	8.85	17.90	8.92	17.86	9.00	20
21	18.87	9.21	18.83	9.29	18.79	9.37	18.75	9.45	21
22	19.77	9.64	19.73	9.73	19.69	9.82	19.65	9.90	22
23	20.67	10.08	20.63	10.17	20.58	10.26	20.54	10.35	23
24	21.57	10.52	21.52	10.61	21.48	10.71	21.43	10.80	24
25	22.47	10.96	22.42	11.06	22.37	11.16	22.32	11.25	25
26	23.37	11.40	23.32	11.50	23.27	11.60	23.22	11.70	26
27	24.27	11.84	24.22	11.94	24.16	12.05	24.11	12.15	27
28	25.17	12.27	25.11	12.38	25.06	12.49	25.00	12.60	28
29	26.06	12.71	26.01	12.83	25.95	12.94	25.90	13.05	29
30	26.96	13.15	26.91	13.27	26.85	13.39	26.79	13.50	30
31	27.86	13.59	27.80	13.71	27.74	13.83	27.68	13.95	31
32	28.76	14.03	28.70	14.15	28.64	14.28	28.58	14.40	32
33	29.66	14.47	29.60	14.60	29.53	14.72	29.47	14.85	33
34	30.56	14.90	30.49	15.04	30.43	15.17	30.36	15.30	34
35	31.46	15.34	31.39	15.48	31.32	15.62	31.25	15.75	35
36	32.36	15.78	32.29	15.92	32.22	16.06	32.15	16.20	36
37	33.26	16.22	33.18	16.36	33.11	16.51	33.04	16.65	37
38	34.15	16.66	34.08	16.81	34.01	16.96	33.93	17.10	38
39	35.05	17.10	34.98	17.25	34.90	17.40	34.83	17.55	39
40	35.95	17.53	35.87	17.69	35.80	17.85	35.72	18.00	40
41	36.85	17.97	36.77	18.13	36.69	18.29	36.61	18.45	41
42	37.75	18.41	37.67	18.58	37.59	18.74	37.51	18.90	42
43	38.65	18.85	38.57	19.02	38.48	19.19	38.40	19.35	43
44	39.55	19.29	39.46	19.46	39.38	19.63	39.29	19.80	44
45	40.45	19.73	40.36	19.90	40.27	20.08	40.18	20.25	45
46	41.34	20.17	41.26	20.35	41.17	20.53	41.08	20.70	46
47	42.23	20.60	42.15	20.79	42.06	20.97	41.97	21.15	47
48	43.14	21.04	43.05	21.23	42.96	21.42	42.86	21.60	48
49	44.04	21.48	43.95	21.67	43.85	21.86	43.76	22.05	49
50	44.94	21.92	44.84	22.11	44.75	22.31	44.65	22.51	50
51	45.84	22.36	45.74	22.56	45.64	22.76	45.54	22.96	51
52	46.74	22.80	46.64	23.00	46.54	23.20	46.44	23.41	52
53	47.64	23.23	47.53	23.44	47.43	23.65	47.32	23.86	53
54	48.54	23.67	48.43	23.88	48.33	24.10	48.21	24.31	54
55	49.43	24.11	49.33	24.33	49.22	24.54	49.11	24.76	55
56	50.33	24.55	50.23	24.77	50.12	24.99	50.01	25.21	56
57	51.23	24.99	51.12	25.21	51.01	25.43	50.89	25.66	57
58	52.13	25.43	52.02	25.65	51.91	25.88	51.78	26.11	58
59	53.03	25.86	52.92	26.10	52.80	26.33	52.68	26.56	59
60	53.93	26.30	53.81	26.54	53.70	26.77	53.57	27.01	60
61	54.83	26.74	54.71	26.98	54.59	27.22	54.47	27.46	61
62	55.73	27.18	55.61	27.42	55.49	27.66	55.37	27.91	62
63	56.62	27.62	56.50	27.86	56.38	28.11	56.25	28.36	63
64	57.52	28.05	57.40	28.31	57.28	28.56	57.15	28.81	64
65	58.42	28.49	58.30	28.75	58.17	29.00	58.04	29.26	65
66	59.32	28.93	59.19	29.19	59.07	29.45	58.94	29.71	66
67	60.22	29.37	60.09	29.63	59.96	29.89	59.83	30.16	67
68	61.12	29.81	60.99	30.07	60.86	30.34	60.72	30.61	68
69	62.02	30.24	61.89	30.52	61.75	30.79	61.62	31.06	69
70	62.92	30.69	62.78	30.96	62.65	31.23	62.51	31.51	70
Dist.	Dep	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dist.
	64°	0′	63°	45′	63°	30′	63°	15′	

Dist.	27° 0′		27° 15′		27° 30′		27° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.89	0.45	0.89	0.46	0.89	0.46	0.88	0.47	1
2	1.78	0.91	1.78	0.92	1.77	0.92	1.77	0.93	2
3	2.67	1.36	2.67	1.37	2.66	1.39	2.65	1.40	3
4	3.56	1.82	3.56	1.83	3.55	1.85	3.54	1.86	4
5	4.46	2.27	4.45	2.29	4.44	2.31	4.42	2.33	5
6	5.35	2.72	5.33	2.75	5.32	2.77	5.31	2.79	6
7	6.24	3.18	6.22	3.21	6.21	3.23	6.19	3.26	7
8	7.13	3.63	7.11	3.66	7.10	3.69	7.08	3.72	8
9	8.02	4.09	8.00	4.12	7.98	4.16	7.96	4.19	9
10	8.91	4.54	8.89	4.58	8.87	4.62	8.85	4.66	10
11	9.80	4.99	9.78	5.04	9.76	5.08	9.73	5.12	11
12	10.69	5.45	10.67	5.49	10.64	5.54	10.62	5.59	12
13	11.58	5.90	11.56	5.95	11.53	6.00	11.50	6.05	13
14	12.47	6.36	12.45	6.41	12.42	6.46	12.39	6.52	14
15	13.37	6.81	13.34	6.87	13.31	6.93	13.27	6.98	15
16	14.26	7.26	14.22	7.33	14.19	7.39	14.16	7.45	16
17	15.15	7.72	15.11	7.78	15.08	7.85	15.04	7.92	17
18	16.04	8.17	16.00	8.24	15.97	8.31	15.93	8.38	18
19	16.93	8.63	16.89	8.70	16.85	8.77	16.81	8.85	19
20	17.82	9.08	17.78	9.16	17.74	9.23	17.70	9.31	20
21	18.71	9.53	18.67	9.62	18.63	9.70	18.58	9.78	21
22	19.60	9.99	19.56	10.07	19.51	10.16	19.47	10.24	22
23	20.49	10.44	20.45	10.53	20.40	10.62	20.35	10.71	23
24	21.38	10.90	21.34	10.99	21.29	11.08	21.24	11.17	24
25	22.28	11.35	22.23	11.45	22.18	11.54	22.12	11.64	25
26	23.17	11.80	23.11	11.90	23.06	12.01	23.01	12.11	26
27	24.06	12.26	24.00	12.36	23.95	12.47	23.89	12.57	27
28	24.95	12.71	24.89	12.82	24.84	12.93	24.78	13.04	28
29	25.84	13.17	25.78	13.28	25.72	13.39	25.66	13.50	29
30	26.73	13.62	26.67	13.74	26.61	13.85	26.57	13.97	30
31	27.62	14.07	27.56	14.19	27.50	14.31	27.43	14.43	31
32	28.51	14.53	28.45	14.65	28.38	14.78	28.32	14.90	32
33	29.40	14.98	29.34	15.11	29.27	15.24	29.20	15.37	33
34	30.29	15.44	30.23	15.57	30.16	15.70	30.09	15.83	34
35	31.19	15.89	31.12	16.03	31.05	16.16	30.97	16.30	35
36	32.08	16.34	32.00	16.48	31.93	16.62	31.86	16.76	36
37	32.97	16.80	32.89	16.94	32.82	17.08	32.74	17.23	37
38	33.86	17.25	33.78	17.40	33.71	17.55	33.63	17.69	38
39	34.75	17.71	34.67	17.86	34.59	18.01	34.51	18.16	39
40	35.64	18.16	35.56	18.31	35.48	18.47	35.40	18.62	40
41	36.53	18.61	36.45	18.77	36.37	18.93	36.28	19.09	41
42	37.42	19.07	37.34	19.23	37.25	19.39	37.17	19.56	42
43	38.31	19.52	38.23	19.69	38.14	19.86	38.05	20.02	43
44	39.20	19.98	39.12	20.15	39.03	20.32	38.94	20.49	44
45	40.10	20.43	40.01	20.60	39.92	20.78	39.82	20.95	45
46	40.99	20.88	40.89	21.06	40.80	21.24	40.71	21.42	46
47	41.88	21.34	41.78	21.52	41.69	21.70	41.59	21.88	47
48	42.77	21.79	42.67	21.98	42.58	22.16	42.48	22.35	48
49	43.66	22.25	43.56	22.44	43.46	22.63	43.36	22.81	49
50	44.55	22.70	44.45	22.89	44.35	23.09	44.25	23.28	50
51	45.44	23.15	45.35	23.35	45.25	23.55	45.14	23.75	51
52	46.33	23.61	46.23	23.81	46.12	24.01	46.02	24.21	52
53	47.22	24.06	47.12	24.27	47.01	24.47	46.91	24.68	53
54	48.12	24.52	48.02	24.73	47.91	24.94	47.79	25.15	54
55	49.01	24.97	48.90	25.19	48.79	25.40	48.68	25.61	55
56	49.90	25.42	49.78	25.64	49.68	25.86	49.56	26.08	56
57	50.79	25.88	50.67	26.10	50.57	26.32	50.45	26.54	57
58	51.68	26.33	51.56	26.56	51.45	26.78	51.33	27.01	58
59	52.57	26.79	52.45	27.02	52.33	27.25	52.22	27.48	59
60	53.46	27.24	53.34	27.47	53.22	27.71	53.10	27.95	60
61	54.35	27.69	54.23	27.93	54.11	28.17	53.98	28.40	61
62	55.24	28.15	55.12	28.39	55.00	28.63	54.87	28.87	62
63	56.13	28.60	56.02	28.85	55.88	29.09	55.75	29.34	63
64	57.03	29.06	56.90	29.30	56.77	29.55	56.64	29.80	64
65	57.92	29.51	57.79	29.76	57.66	30.02	57.52	30.27	65
66	58.81	29.96	58.68	30.22	58.54	30.48	58.41	30.73	66
67	59.70	30.42	59.56	30.68	59.43	30.94	59.29	31.20	67
68	60.59	30.87	60.45	31.14	60.32	31.40	60.18	31.67	68
69	61.48	31.33	61.34	31.59	61.20	31.86	61.06	32.13	69
70	62.37	31.78	62.23	32.06	62.09	32.32	61.95	32.59	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	63° 0′		62° 45′		62° 30′		62° 15′		

Dist.	28° 0′		28° 15′		28° 30′		28° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.88	0.47	0.88	0.47	0.88	0.48	0.88	0.48	1
2	1.77	0.94	1.76	0.95	1.76	0.95	1.75	0.96	2
3	2.65	1.41	2.64	1.42	2.64	1.43	2.63	1.44	3
4	3.53	1.88	3.52	1.89	3.52	1.91	3.51	1.92	4
5	4.41	2.35	4.40	2.37	4.39	2.39	4.38	2.40	5
6	5.30	2.82	5.29	2.84	5.27	2.86	5.26	2.89	6
7	6.18	3.29	6.17	3.31	6.15	3.34	6.14	3.37	7
8	7.06	3.76	7.05	3.79	7.03	3.82	7.01	3.85	8
9	7.95	4.23	7.93	4.26	7.91	4.29	7.89	4.33	9
10	8.83	4.69	8.81	4.73	8.79	4.77	8.77	4.81	10
11	9.71	5.16	9.69	5.21	9.67	5.25	9.64	5.29	11
12	10.60	5.63	10.57	5.68	10.55	5.73	10.52	5.77	12
13	11.48	6.10	11.45	6.15	11.42	6.20	11.40	6.25	13
14	12.36	6.57	12.33	6.63	12.30	6.68	12.27	6.73	14
15	13.24	7.04	13.21	7.10	13.18	7.16	13.15	7.21	15
16	14.13	7.51	14.09	7.57	14.06	7.63	14.03	7.70	16
17	15.01	7.98	14.98	8.05	14.94	8.11	14.90	8.18	17
18	15.89	8.45	15.86	8.52	15.82	8.59	15.78	8.66	18
19	16.78	8.92	16.74	8.99	16.70	9.07	16.66	9.14	19
20	17.66	9.39	17.62	9.47	17.58	9.54	17.53	9.62	20
21	18.54	9.86	18.50	9.94	18.46	10.02	18.41	10.10	21
22	19.42	10.33	19.38	10.41	19.33	10.50	19.29	10.58	22
23	20.31	10.80	20.26	10.89	20.21	10.97	20.16	11.06	23
24	21.19	11.27	21.14	11.36	21.09	11.45	21.04	11.54	24
25	22.07	11.74	22.02	11.83	21.97	11.93	21.92	12.02	25
26	22.96	12.21	22.90	12.31	22.85	12.41	22.79	12.51	26
27	23.84	12.68	23.78	12.78	23.73	12.88	23.67	12.99	27
28	24.72	13.15	24.66	13.25	24.61	13.36	24.55	13.47	28
29	25.61	13.61	25.55	13.73	25.49	13.84	25.43	13.95	29
30	26.49	14.08	26.43	14.20	26.36	14.31	26.30	14.43	30
31	27.37	14.55	27.31	14.67	27.24	14.79	27.18	14.91	31
32	28.25	15.02	28.19	15.15	28.12	15.27	28.06	15.39	32
33	29.14	15.49	29.07	15.62	29.00	15.75	28.93	15.87	33
34	30.02	15.96	29.95	16.09	29.88	16.22	29.81	16.35	34
35	30.90	16.43	30.83	16.57	30.76	16.70	30.69	16.83	35
36	31.79	16.90	31.71	17.04	31.64	17.18	31.56	17.32	36
37	32.67	17.37	32.59	17.51	32.52	17.65	32.44	17.80	37
38	33.55	17.84	33.47	17.99	33.40	18.13	33.32	18.28	38
39	34.44	18.31	34.35	18.46	34.27	18.61	34.19	18.76	39
40	35.32	18.78	35.24	18.93	35.15	19.09	35.07	19.24	40
41	36.20	19.25	36.12	19.41	36.03	19.56	35.95	19.72	41
42	37.08	19.72	37.00	19.88	36.91	20.04	36.82	20.20	42
43	37.97	20.19	37.88	20.35	37.79	20.52	37.70	20.68	43
44	38.85	20.66	38.76	20.83	38.67	21.00	38.58	21.16	44
45	39.73	21.13	39.64	21.30	39.55	21.47	39.45	21.64	45
46	40.62	21.60	40.52	21.77	40.43	21.95	40.33	22.13	46
47	41.50	22.07	41.40	22.25	41.30	22.43	41.21	22.61	47
48	42.38	22.53	42.28	22.72	42.18	22.90	42.08	23.09	48
49	43.26	23.00	43.16	23.19	43.06	23.38	42.96	23.57	49
50	44.15	23.47	44.04	23.67	43.94	23.86	43.84	24.05	50
51	45.03	23.94	44.93	24.14	44.82	24.34	44.71	24.53	51
52	45.91	24.41	45.81	24.61	45.70	24.81	45.59	25.01	52
53	46.80	24.88	46.69	25.09	46.58	25.29	46.47	25.49	53
54	47.68	25.35	47.57	25.56	47.46	25.77	47.35	25.97	54
55	48.56	25.82	48.45	26.03	48.34	26.24	48.22	26.46	55
56	49.45	26.29	49.33	26.50	49.22	26.72	49.10	26.94	56
57	50.33	26.76	50.21	26.97	50.09	27.20	49.98	27.42	57
58	51.21	27.23	51.09	27.46	50.97	27.67	50.85	27.90	58
59	52.10	27.70	51.97	27.92	51.85	28.15	51.73	28.38	59
60	52.98	28.17	52.85	28.40	52.73	28.63	52.60	28.86	60
61	53.86	28.64	53.73	28.87	53.61	29.11	53.48	29.34	61
62	54.74	29.11	54.62	29.35	54.49	29.58	54.36	29.82	62
63	55.63	29.58	55.50	29.82	55.37	30.06	55.24	30.30	63
64	56.51	30.04	56.38	30.29	56.25	30.54	56.11	30.78	64
65	57.39	30.51	57.26	30.76	57.12	31.02	56.99	31.26	65
66	58.28	30.98	58.14	31.24	58.00	31.49	57.87	31.75	66
67	59.16	31.45	59.02	31.70	58.88	31.97	58.74	32.23	67
68	60.04	31.92	59.90	32.18	59.76	32.45	59.62	32.71	68
69	60.92	32.39	60.78	32.66	60.64	32.92	60.50	33.19	69
70	61.81	32.86	61.66	33.13	61.52	33.40	61.37	33.67	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	62° 0′		61° 45′		61° 30′		61° 15′		

Dist.	29° 0′		29° 15′		29° 30′		29° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.87	0.48	0.87	0.49	0.87	0.49	0.87	0.50	1
2	1.75	0.97	1.75	0.98	1.74	0.98	1.74	0.99	2
3	2.62	1.45	2.62	1.47	2.61	1.48	2.60	1.49	3
4	3.50	1.94	3.49	1.95	3.48	1.97	3.47	1.98	4
5	4.37	2.42	4.36	2.44	4.35	2.46	4.34	2.48	5
6	5.25	2.91	5.24	2.93	5.22	2.95	5.21	2.98	6
7	6.12	3.39	6.11	3.42	6.09	3.45	6.08	3.47	7
8	7.00	3.88	6.98	3.91	6.96	3.94	6.95	3.97	8
9	7.87	4.36	7.85	4.40	7.83	4.43	7.81	4.47	9
10	8.75	4.85	8.73	4.89	8.70	4.92	8.68	4.96	10
11	9.62	5.33	9.60	5.37	9.57	5.42	9.55	5.46	11
12	10.50	5.82	10.47	5.86	10.44	5.91	10.42	5.95	12
13	11.37	6.30	11.34	6.35	11.31	6.40	11.29	6.45	13
14	12.24	6.79	12.22	6.84	12.19	6.89	12.15	6.95	14
15	13.12	7.27	13.09	7.33	13.06	7.39	13.02	7.44	15
16	13.99	7.76	13.96	7.82	13.93	7.88	13.89	7.94	16
17	14.87	8.24	14.83	8.31	14.80	8.37	14.76	8.44	17
18	15.74	8.73	15.71	8.80	15.67	8.86	15.63	8.93	18
19	16.62	9.21	16.58	9.28	16.54	9.36	16.50	9.43	19
20	17.49	9.70	17.45	9.77	17.41	9.85	17.36	9.92	20
21	18.37	10.18	18.32	10.26	18.28	10.34	18.23	10.42	21
22	19.24	10.67	19.20	10.75	19.15	10.83	19.10	10.92	22
23	20.12	11.15	20.07	11.24	20.02	11.33	19.97	11.41	23
24	20.99	11.64	20.94	11.73	20.89	11.82	20.84	11.91	24
25	21.87	12.12	21.81	12.22	21.76	12.31	21.70	12.41	25
26	22.74	12.61	22.69	12.70	22.63	12.80	22.57	12.90	26
27	23.61	13.09	23.56	13.19	23.50	13.30	23.44	13.40	27
28	24.49	13.57	24.43	13.68	24.37	13.79	24.31	13.89	28
29	25.36	14.06	25.30	14.17	25.24	14.28	25.18	14.39	29
30	26.24	14.54	26.18	14.66	26.11	14.77	26.05	14.89	30
31	27.11	15.03	27.05	15.15	26.98	15.27	26.91	15.38	31
32	27.99	15.51	27.92	15.64	27.85	15.76	27.78	15.88	32
33	28.86	16.00	28.79	16.12	28.72	16.25	28.65	16.38	33
34	29.74	16.48	29.67	16.61	29.59	16.74	29.52	16.87	34
35	30.61	16.97	30.54	17.10	30.46	17.23	30.39	17.37	35
36	31.49	17.45	31.41	17.59	31.33	17.73	31.25	17.86	36
37	32.36	17.94	32.28	18.08	32.20	18.22	32.12	18.36	37
38	33.24	18.42	33.16	18.57	33.07	18.71	32.99	18.86	38
39	34.11	18.91	34.03	19.06	33.94	19.20	33.86	19.35	39
40	34.98	19.39	34.90	19.54	34.81	19.70	34.73	19.85	40
41	35.86	19.88	35.77	20.03	35.68	20.19	35.60	20.35	41
42	36.73	20.36	36.65	20.52	36.56	20.68	36.46	20.84	42
43	37.61	20.85	37.52	21.01	37.43	21.17	37.33	21.34	43
44	38.48	21.33	38.39	21.50	38.30	21.67	38.20	21.83	44
45	39.36	21.82	39.26	21.99	39.17	22.16	39.07	22.33	45
46	40.23	22.30	40.14	22.48	40.04	22.65	39.94	22.83	46
47	41.11	22.79	41.01	22.97	40.91	23.14	40.81	23.32	47
48	41.98	23.27	41.88	23.45	41.78	23.64	41.67	23.82	48
49	42.86	23.76	42.75	23.94	42.65	24.13	42.54	24.31	49
50	43.73	24.24	43.63	24.43	43.52	24.62	43.41	24.81	50
51	44.61	24.73	44.50	24.93	44.39	25.11	44.28	25.31	51
52	45.48	25.21	45.37	25.42	45.26	25.61	45.15	25.80	52
53	46.36	25.70	46.24	25.91	46.13	26.10	46.01	26.30	53
54	47.23	26.18	47.12	26.40	47.00	26.59	46.88	26.80	54
55	48.11	26.67	47.99	26.89	47.87	27.08	47.75	27.29	55
56	48.98	27.15	48.86	27.37	48.74	27.57	48.62	27.79	56
57	49.86	27.64	49.74	27.86	49.61	28.07	49.49	28.28	57
58	50.73	28.12	50.61	28.35	50.48	28.56	50.35	28.78	58
59	51.60	28.61	51.48	28.84	51.35	29.06	51.22	29.28	59
60	52.48	29.09	52.35	29.32	52.22	29.55	52.09	29.77	60
61	53.35	29.57	53.22	29.81	53.09	30.04	52.96	30.27	61
62	54.23	30.06	54.10	30.29	53.96	30.53	53.83	30.77	62
63	55.10	30.54	54.97	30.78	54.83	31.02	54.70	31.26	63
64	55.98	31.03	55.84	31.27	55.70	31.51	55.56	31.76	64
65	56.85	31.51	56.72	31.76	56.57	32.01	56.43	32.25	65
66	57.73	32.00	57.59	32.25	57.44	32.50	57.30	32.75	66
67	58.60	32.48	58.46	32.74	58.31	32.99	58.17	33.25	67
68	59.48	32.97	59.33	33.23	59.18	33.48	59.04	33.74	68
69	60.35	33.46	60.21	33.72	60.05	33.97	59.90	34.24	69
70	61.22	33.94	61.08	34.20	60.93	34.47	60.77	34.74	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	61° 0′		60° 45′		60° 30′		60° 15′		

Dist.	30° 0'		30 15'		30° 30'		30° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.87	0.50	0.86	0.50	0.86	0.51	0,86	0.51	1
2	1.73	1.00	1.73	1.01	1.72	1.02	1.72	1.02	2
3	2.60	1.50	2.59	1.51	2.58	1.52	2.58	1.53	3
4	3.46	2.00	3.46	2.02	3.45	2.03	3.44	2.05	4
5	4.33	2.50	4.32	2.52	4.31	2.54	4.30	2.56	5
6	5.20	3.00	5.18	3.02	5.17	3.05	5.16	3.07	6
7	6.06	3.50	6.05	3.53	6.03	3.55	6.02	3.58	7
8	6.93	4.00	6.91	4.03	6.89	4.06	6.88	4.09	8
9	7.79	4.50	7.77	4.53	7.75	4.57	7.73	4.60	9
10	8.66	5.00	8.64	5.04	8.62	5.08	8.59	5.11	10
11	9.53	5.50	9.50	5.54	9.48	5.58	9.45	5.62	11
12	10.39	6.00	10.37	6,05	10.34	6.09	10.31	6.14	12
13	11.26	6.50	11.23	6.55	11.20	6.60	11.17	6.65	13
14	12.12	7.00	12.09	7.05	12.06	7.11	12.03	7.16	14
15	12.99	7.50	12.96	7.56	12.92	7.61	12.89	7.67	15
16	13.86	8.00	13.82	8.06	13.79	8.12	13.75	8.18	16
17	14.72	8.50	14.69	8.56	14.65	8.63	14.61	8.69	17
18	15.59	9.00	15.55	9.07	15.51	9.14	15.47	9.20	18
19	16.45	9.50	16.41	9.57	16.37	9.64	16.33	9.71	19
20	17.32	10.00	17.28	10.08	17.23	10.15	17.19	10.23	20
21	18.19	10.50	18.14	10.58	18.09	10.66	18.05	10.74	21
22	19.05	11.00	19.00	11.08	18.96	11.17	18.91	11.25	22
23	19.92	11.50	19.87	11.59	19.82	11.67	19.77	11.76	23
24	20.78	12.00	20.73	12.09	20.68	12.18	20.63	12.27	24
25	21.65	12.50	21.60	12.59	21.54	12.69	21.49	12.78	25
26	22.52	13.00	22.46	13.10	22.40	13.20	22.34	13.29	26
27	23.38	13.50	23.32	13.60	23.26	13.70	23.20	13.80	27
28	24.25	14.00	24.19	14.11	24.13	14.21	24.06	14.32	28
29	25.11	14.50	25.05	14.61	24.99	14.72	24.92	14.83	29
30	25.98	15.00	25.92	15.11	25.85	15.23	25.78	15.34	30
31	26.85	15.50	26.78	15.62	26.71	15.73	26.64	15.85	31
32	27.71	16.00	27.64	16.12	27.57	16.24	27.50	16.36	32
33	28.58	16.50	28.51	16.62	28.43	16.75	28.36	16.87	33
34	29.45	17.00	29.37	17.13	29.30	17.26	29.22	17.38	34
35	30.31	17.50	30.23	17.63	30.16	17.76	30.08	17.90	35
36	31.18	18.00	31.10	18.14	31.02	18.27	30.94	18.41	36
37	32.04	18.50	31.96	18.64	31.88	18.78	31.80	18.92	37
38	32.91	19.00	32.83	19.14	32.74	19.29	32.66	19.43	38
39	33.78	19.50	33.69	19.65	33.60	19.79	33.52	19.94	39
40	34.64	20.00	34.55	20.15	34.47	20.30	34.38	20.45	40
41	35.51	20.50	35.42	20.65	35.33	20.81	35.24	20.96	41
42	36.37	21.00	36.28	21.16	36.19	21.32	36.10	21.47	42
43	37.24	21.50	37.15	21.66	37.05	21.82	36.95	21.99	43
44	38.11	22.00	38.01	22.17	37.91	22.33	37.81	22.50	44
45	38.97	22.50	38.87	22.67	38.77	22.84	38.67	23.01	45
46	39.84	23.00	39.74	23.17	39.64	23.35	39.53	23.52	46
47	40.70	23.50	40.60	23.68	40.50	23.85	40.39	24.03	47
48	41.57	24.00	41.46	24.18	41.36	24.36	41.25	24.54	48
49	42.44	24,50	42.33	24.68	42.22	24.87	42.11	25.05	49
50	43.30	25.00	43.19	25.19	43.08	25.38	42.97	25.56	50
51	44.17	25.50	44.06	25.69	43.94	25.88	43.83	26.08	51
52	45.03	26.00	44.92	26.20	44.81	26.39	44.69	26.59	52
53	45.90	26.50	45.78	26.70	45.67	26.90	45,55	27.10	53
54	46.76	27.00	46.65	27.20	46.53	27.41	46.41	27.61	54
55	47.63	27.50	47.51	27.71	47.39	27.92	47.27	28.12	55
56	48.50	28.00	48.38	28.21	48.25	28.42	48.13	28.63	56
57	49.36	28.50	49.24	28.72	49.12	28.93	48.98	29.14	57
58	50.23	29.00	50.10	29.22	49.98	29.44	49.84	29.65	58
59	51.10	29.50	50.97	29.72	50.84	29.95	50.70	30.16	59
60	51.96	30.00	51.83	30.23	51.70	30.45	51.56	30.68	60
61	52.83	30.50	52.69	30.73	52.56	30.96	52.42	31.19	61
62	53.69	31.00	53.56	31.23	53.42	31.47	53.28	31.70	62
63	54.36	31.50	54.42	31.74	54.28	31.98	54.14	32.21	63
64	55.43	32.00	55.29	32.24	55.15	32.48	55.00	32.72	64
65	56.29	32.50	56.15	32.75	56.01	32.99	55.86	33.23	65
66	57.16	33.00	57.01	33.25	56.87	33.50	56.72	33.74	66
67	58.02	33.50	57.88	33.75	57.73	34.01	57.58	34.25	67
68	58.89	34.00	58.74	34.26	58.59	34.52	58.44	34.76	68
69	59.76	34.50	59.61	34.76	59.46	35.02	59.30	35.28	69
70	60.62	35.00	60.47	35.26	60.31	35.53	60.16	35.79	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dist.
	60° 0'		59° 45'		59° 30'		59° 15'		

Dist.	31° 0'		31° 15'		31° 30'		31° 45'		Dist.
	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.86	0.52	0.85	0.52	0.85	0.52	0.85	0.53	1
2	1.71	1.03	1.71	1.04	1.71	1.04	1.70	1.05	2
3	2.57	1.55	2.56	1.56	2.56	1.57	2.55	1.58	3
4	3.43	2.06	3.42	2.08	3.41	2.09	3.40	2.10	4
5	4.29	2.58	4.27	2.59	4.26	2.61	4.25	2.63	5
6	5.14	3.09	5.13	3.11	5.12	3.13	5.10	3.16	6
7	6.00	3.61	5.98	3.63	5.97	3.66	5.95	3.68	7
8	6.86	4.12	6.84	4.15	6.82	4.18	6.80	4.21	8
9	7.71	4.64	7.69	4.67	7.67	4.70	7.65	4.74	9
10	8.57	5.15	8.55	5.19	8.53	5.22	8.50	5.26	10
11	9.43	5.67	9.40	5.71	9.38	5.75	9.35	5.79	11
12	10.29	6.18	10.26	6.23	10.23	6.27	10.20	6.31	12
13	11.14	6.70	11.11	6.74	11.08	6.79	11.05	6.84	13
14	12.00	7.21	11.97	7.26	11.94	7.32	11.90	7.37	14
15	12.86	7.73	12.82	7.78	12.79	7.84	12.76	7.89	15
16	13.71	8.24	13.68	8.30	13.64	8.36	13.61	8.42	16
17	14.57	8.76	14.53	8.82	14.49	8.88	14.46	8.95	17
18	15.43	9.27	15.39	9.34	15.35	9.40	15.31	9.47	18
19	16.29	9.79	16.24	9.86	16.20	9.93	16.16	10.00	19
20	17.14	10.30	17.10	10.38	17.05	10.45	17.01	10.52	20
21	18.00	10.82	17.95	10.89	17.91	10.97	17.86	11.05	21
22	18.86	11.33	18.81	11.41	18.76	11.50	18.71	11.58	22
23	19.71	11.85	19.66	11.93	19.61	12.02	19.56	12.10	23
24	20.57	12.36	20.52	12.45	20.46	12.54	20.41	12.63	24
25	21.43	12.88	21.37	12.97	21.32	13.06	21.26	13.16	25
26	22.29	13.39	22.23	13.49	22.17	13.59	22.11	13.68	26
27	23.14	13.91	23.08	14.01	23.02	14.11	22.96	14.21	27
28	24.00	14.42	23.94	14.53	23.87	14.63	23.81	14.73	28
29	24.86	14.94	24.79	15.04	24.73	15.16	24.66	15.26	29
30	25.72	15.45	25.65	15.56	25.58	15.68	25.51	15.79	30
31	26.57	15.97	26.50	16.08	26.43	16.20	26.36	16.31	31
32	27.43	16.48	27.36	16.60	27.28	16.72	27.21	16.84	32
33	28.29	17.00	28.21	17.12	28.14	17.24	28.06	17.36	33
34	29.14	17.51	29.07	17.65	28.99	17.77	28.91	17.89	34
35	30.00	18.03	29.92	18.16	29.84	18.29	29.76	18.42	35
36	30.86	18.54	30.78	18.68	30.70	18.81	30.61	18.94	36
37	31.72	19.06	31.63	19.19	31.55	19.33	31.46	19.47	37
38	32.57	19.57	32.49	19.71	32.40	19.86	32.31	20.00	38
39	33.43	20.09	33.34	20.23	33.25	20.38	33.16	20.52	39
40	34.29	20.60	34.20	20.75	34.12	20.90	34.01	21.05	40
41	35.14	21.12	35.05	21.27	34.96	21.42	34.86	21.57	41
42	36.00	21.63	35.91	21.79	35.81	21.95	35.71	22.10	42
43	36.86	22.15	36.76	22.31	36.66	22.47	36.57	22.63	43
44	37.72	22.66	37.62	22.83	37.52	22.99	37.42	23.15	44
45	38.57	23.18	38.47	23.34	38.37	23.51	38.27	23.68	45
46	39.43	23.69	39.33	23.86	39.22	24.04	39.12	24.21	46
47	40.29	24.21	40.18	24.38	40.07	24.56	39.97	24.73	47
48	41.14	24.72	41.04	24.90	40.93	25.08	40.82	25.26	48
49	42.00	25.24	41.89	25.42	41.78	25.60	41.67	25.78	49
50	42.86	25.75	42.75	25.94	42.63	26.12	42.52	26.31	50
51	43.72	26.27	43.60	26.46	43.48	26.65	43.37	26.84	51
52	44.57	26.77	44.46	26.98	44.34	27.17	44.22	27.36	52
53	45.43	27.29	45.31	27.50	45.19	27.69	45.07	27.89	53
54	46.29	27.80	46.17	28.01	46.04	28.22	45.92	28.41	54
55	47.14	28.32	47.02	28.53	46.90	28.74	46.77	28.94	55
56	48.00	28.85	47.88	29.05	47.75	29.26	47.62	29.47	56
57	48.86	29.35	48.73	29.57	48.60	29.79	48.47	29.00	57
58	49.71	29.86	49.59	30.09	49.46	30.31	49.32	30.52	58
59	50.57	30.38	50.44	30.61	50.31	30.83	50.17	31.04	59
60	51.43	30.90	51.29	31.13	51.16	31.35	51.02	31.57	60
61	52.29	31.42	52.15	31.64	52.01	31.87	51.87	32.10	61
62	53.14	31.93	53.00	32.16	52.86	32.40	52.72	32.62	62
63	54.00	32.45	53.86	32.68	53.72	32.92	53.57	33.15	63
64	54.86	32.96	54.71	33.20	54.57	33.44	54.42	33.68	64
65	55.71	33.48	55.57	33.72	55.42	33.96	55.27	34.20	65
66	56.57	33.99	56.42	34.24	56.28	34.49	56.12	34.73	66
67	57.43	34.51	57.28	34.76	57.13	35.01	56.97	35.25	67
68	58.29	35.02	58.13	35.28	57.98	35.53	57.82	35.78	68
69	59.14	35.54	58.99	35.80	58.83	36.05	58.67	36.31	69
70	60.00	36.05	59.84	36.31	59.68	36.57	59.52	36.83	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	59° 0'		58° 45'		58° 30'		58° 15'		

Dist.	32° 0′		32° 15′		32° 30′		32° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat	Dep	
1	0.85	0.53	0.85	0.53	0.84	0.54	0.84	0.54	1
2	1.70	1.06	1.69	1.07	1.69	1.07	1.68	1.08	2
3	2.54	1.59	2.54	1.60	2.53	1.61	2.52	1.62	3
4	3.39	2.12	3.38	2.13	3.37	2.15	3.36	2.16	4
5	4.24	2.65	4.23	2.67	4.22	2.69	4.21	2.70	5
6	5.09	3.18	5.07	3.20	5.06	3.22	5.05	3.25	6
7	5.94	3.71	5.92	3.74	5.90	3.76	5.89	3.79	7
8	6.78	4.24	6.77	4.27	6.75	4.30	6.73	4.33	8
9	7.63	4.77	7.61	4.80	7.59	4.84	7.57	4.87	9
10	8.48	5.30	8.46	5.34	8.43	5.37	8.41	5.41	10
11	9.33	5.83	9.30	5.87	9.28	5.91	9.25	5.95	11
12	10.18	6.36	10.15	6.40	10.12	6.45	10.09	6.49	12
13	11.02	6.89	10.99	6.94	10.96	6.98	10.93	7.03	13
14	11.87	7.42	11.84	7.47	11.81	7.52	11.77	7.57	14
15	12.72	7.95	12.69	8.00	12.65	8.06	12.62	8.11	15
16	13.57	8.48	13.53	8.54	13.49	8.60	13.46	8.66	16
17	14.42	9.01	14.38	9.07	14.34	9.13	14.30	9.20	17
18	15.26	9.54	15.22	9.60	15.18	9.67	15.14	9.74	18
19	16.11	10.07	16.07	10.14	16.02	10.21	15.98	10.28	19
20	16.96	10.60	16.91	10.67	16.87	10.75	16.82	10.82	20
21	17.81	11.13	17.76	11.21	17.71	11.28	17.66	11.36	21
22	18.66	11.66	18.61	11.74	18.55	11.82	18.50	11.90	22
23	19.51	12.19	19.45	12.27	19.40	12.36	19.34	12.44	23
24	20.35	12.72	20.30	12.81	20.24	12.90	20.18	12.98	24
25	21.20	13.25	21.14	13.34	21.08	13.43	21.03	13.52	25
26	22.05	13.78	21.99	13.87	21.93	13.97	21.87	14.07	26
27	22.90	14.31	22.83	14.41	22.77	14.51	22.71	14.61	27
28	23.75	14.84	23.68	14.94	23.61	15.04	23.55	15.15	28
29	24.59	15.37	24.53	15.47	24.46	15.58	24.39	15.69	29
30	25.44	15.90	25.37	16.01	25.30	16.12	25.23	16.23	30
31	26.29	16.43	26.22	16.54	26.15	16.66	26.07	16.77	31
32	27.14	16.96	27.06	17.08	26.99	17.19	26.91	17.31	32
33	27.99	17.49	27.91	17.61	27.83	17.73	27.75	17.85	33
34	28.83	18.02	28.75	18.14	28.68	18.27	28.60	18.39	34
35	29.68	18.55	29.60	18.68	29.52	18.81	29.44	18.93	35
36	30.53	19.08	30.45	19.21	30.36	19.34	30.28	19.47	36
37	31.38	19.61	31.29	19.74	31.21	19.88	31.12	20.02	37
38	32.23	20.14	32.14	20.28	32.05	20.42	31.96	20.56	38
39	33.07	20.67	32.98	20.81	32.89	20.95	32.80	21.10	39
40	33.92	21.20	33.83	21.34	33.74	21.49	33.64	21.64	40
41	34.77	21.73	34.67	21.88	34.58	22.03	34.48	22.18	41
42	35.62	22.26	35.52	22.41	35.42	22.57	35.32	22.72	42
43	36.47	22.79	36.37	22.95	36.27	23.10	36.16	23.26	43
44	37.31	23.32	37.21	23.48	37.11	23.64	37.01	23.80	44
45	38.16	23.85	38.06	24.01	37.95	24.18	37.85	24.34	45
46	39.01	24.38	38.90	24.55	38.80	24.72	38.69	24.88	46
47	39.86	24.91	39.75	25.08	39.64	25.25	39.53	25.43	47
48	40.71	25.44	40.60	25.61	40.48	25.79	40.37	25.97	48
49	41.55	25.97	41.44	26.15	41.33	26.33	41.21	26.51	49
50	42.40	26.50	42.29	26.68	42.17	26.86	42.05	27.05	50
51	43.25	27.03	43.13	27.21	43.01	27.40	42.89	27.59	51
52	44.10	27.56	43.98	27.75	43.86	27.94	43.73	28.13	52
53	44.95	28.09	44.82	28.28	44.70	28.48	44.57	28.67	53
54	45.79	28.62	45.67	28.82	45.54	29.01	45.42	29.21	54
55	46.64	29.15	46.52	29.35	46.38	29.55	46.26	29.75	55
56	47.49	29.68	47.36	29.88	47.23	30.09	47.10	30.29	56
57	48.34	30.21	48.21	30.42	48.07	30.62	47.94	30.84	57
58	49.19	30.74	49.05	30.95	48.91	31.16	48.78	31.38	58
59	50.03	31.27	49.90	31.49	49.76	31.70	49.62	31.92	59
60	50.88	31.79	50.74	32.02	50.60	32.24	50.46	32.46	60
61	51.73	32.32	51.59	32.55	51.45	32.77	51.30	33.00	61
62	52.58	32.85	52.44	33.08	52.29	33.31	52.14	33.54	62
63	53.42	33.38	53.28	33.62	53.13	33.85	52.98	34.08	63
64	54.27	33.91	54.13	34.15	53.97	34.39	53.83	34.62	64
65	55.12	34.44	54.97	34.69	54.82	34.92	54.67	35.16	65
66	55.97	34.97	55.82	35.22	55.66	35.46	55.51	35.71	66
67	56.81	35.50	56.67	35.75	56.50	35.99	56.35	36.25	67
68	57.66	36.03	57.51	36.29	57.35	36.53	57.19	36.79	68
69	58.51	36.56	58.36	36.82	58.19	37.07	58.03	37.33	69
70	59.36	37.09	59.20	37.35	59.04	37.61	58.87	37.87	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	58° 0′		57° 45′		57° 30′		57° 15′		

Dist.	33° 0′		33° 15′		33° 30′		33° 45′		Dist.
	Lat.	Dep.	Lat.	Dep	Lat.	Dep.	Lat.	Dep.	
1	0.84	0.54	0.84	0.55	0.83	0.55	0.83	0.56	1
2	1.68	1.09	1.67	1.10	1.67	1.10	1.66	1.11	2
3	2.52	1.63	2.51	1.64	2.50	1.66	2.49	1.67	3
4	3.35	2.18	3.35	2.19	3.34	2.21	3.33	2.22	4
5	4.19	2.72	4.18	2.74	4.17	2.76	4.16	2.78	5
6	5.03	3.27	5.02	3.29	5.00	3.31	4.99	3.33	6
7	5.87	3.81	5.85	3.84	5.84	3.86	5.82	3.89	7
8	6.71	4.36	6.69	4.39	6.67	4.42	6.65	4.44	8
9	7.55	4.90	7.53	4.93	7.51	4.97	7.48	5.00	9
10	8.39	5.45	8.36	5.48	8.34	5.52	8.31	5.56	10
11	9.23	5.99	9.20	6.03	9.17	6.07	9.15	6.11	11
12	10.06	6.54	10.04	6.58	10.01	6.62	9.98	6.67	12
13	10.90	7.08	10.87	7.13	10.84	7.18	10.81	7.22	13
14	11.74	7.62	11.71	7.68	11.67	7.73	11.64	7.78	14
15	12.58	8.17	12.54	8.22	12.51	8.28	12.47	8.33	15
16	13.42	8.71	13.38	8.77	13.34	8.83	13.30	8.89	16
17	14.26	9.26	14.22	9.32	14.18	9.38	14.13	9.44	17
18	15.10	9.80	15.05	9.87	15.01	9.93	14.97	10.00	18
19	15.93	10.35	15.89	10.42	15.84	10.49	15.80	10.56	19
20	16.77	10.89	16.73	10.97	16.68	11.04	16.63	11.11	20
21	17.61	11.44	17.56	11.51	17.51	11.59	17.46	11.67	21
22	18.45	11.98	18.40	12.06	18.35	12.14	18.29	12.22	22
23	19.29	12.53	19.23	12.61	19.18	12.69	19.12	12.78	23
24	20.13	13.07	20.07	13.16	20.01	13.25	19.96	13.33	24
25	20.97	13.62	20.91	13.71	20.85	13.80	20.79	13.89	25
26	21.81	14.16	21.74	14.26	21.68	14.35	21.62	14.44	26
27	22.64	14.71	22.58	14.80	22.52	14.90	22.45	15.00	27
28	23.48	15.25	23.42	15.35	23.35	15.45	23.28	15.56	28
29	24.32	15.79	24.25	15.90	24.18	16.01	24.11	16.11	29
30	25.16	16.34	25.09	16.45	25.02	16.56	24.94	16.67	30
31	26.00	16.88	25.92	17.00	25.85	17.11	25.78	17.22	31
32	26.84	17.43	26.76	17.55	26.68	17.66	26.61	17.78	32
33	27.68	17.97	27.60	18.09	27.52	18.21	27.44	18.33	33
34	28.51	18.52	28.43	18.64	28.35	18.77	28.27	18.89	34
35	29.35	19.06	29.27	19.19	29.19	19.32	29.10	19.44	35
36	30.19	19.61	30.11	19.74	30.02	19.87	29.93	20.00	36
37	31.03	20.15	30.94	20.29	30.85	20.42	30.76	20.56	37
38	31.87	20.70	31.78	20.84	31.69	20.97	31.60	21.11	38
39	32.71	21.24	32.62	21.38	32.52	21.53	32.43	21.67	39
40	33.55	21.79	33.45	21.93	33.36	22.08	33.26	22.22	40
41	34.39	22.33	34.29	22.48	34.19	22.63	34.09	22.78	41
42	35.22	22.87	35.12	23.03	35.02	23.18	34.92	23.33	42
43	36.06	23.42	35.96	23.58	35.86	23.73	35.75	23.89	43
44	36.90	23.96	36.80	24.12	36.69	24.29	36.58	24.45	44
45	37.74	24.51	37.63	24.67	37.53	24.84	37.42	25.00	45
46	38.58	25.05	38.46	25.22	38.36	25.39	38.25	25.56	46
47	39.42	25.60	39.31	25.77	39.19	25.94	39.08	26.11	47
48	40.26	26.14	40.14	26.32	40.03	26.49	39.91	26.67	48
49	41.09	26.69	40.98	26.87	40.86	27.05	40.74	27.22	49
50	41.93	27.23	41.81	27.41	41.69	27.60	41.57	27.78	50
51	42.77	27.78	42.65	27.96	42.53	28.15	42.41	28.34	51
52	43.61	28.34	43.49	28.51	43.36	28.70	43.24	28.89	52
53	44.45	28.89	44.32	29.06	44.20	29.25	44.07	29.45	53
54	45.29	29.41	45.16	29.61	45.03	29.80	44.90	30.00	54
55	46.13	29.96	45.99	30.15	45.86	30.36	45.73	30.56	55
56	46.97	30.50	46.83	30.70	46.70	30.91	46.56	31.12	56
57	47.80	31.04	47.67	31.25	47.53	31.46	47.39	31.67	57
58	48.64	31.59	48.50	31.80	48.37	32.01	48.22	32.23	58
59	49.48	32.13	49.34	32.35	49.20	32.56	49.05	32.78	59
60	50.32	32.68	50.13	32.90	50.03	33.12	49.89	33.33	60
61	51.16	33.22	51.01	33.44	50.87	33.67	50.72	33.89	61
62	52.00	33.77	51.85	33.98	51.70	34.22	51.55	34.45	62
63	52.84	34.31	52.68	34.53	52.53	34.77	52.38	35.00	63
64	53.67	34.86	53.52	35.08	53.37	35.32	53.21	35.56	64
65	54.51	35.40	54.36	35.63	54.20	35.88	54.04	36.11	65
66	55.35	35.95	55.19	36.17	55.04	36.43	54.87	36.67	66
67	56.19	36.50	56.03	36.72	55.87	36.98	55.71	37.23	67
68	57.03	37.04	56.86	37.27	56.70	37.53	56.54	37.78	68
69	57.87	37.58	57.70	37.82	57.54	38.08	57.37	38.34	69
70	58.71	38.12	58.54	38.38	58.37	38.64	58.20	38.89	70
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	57° 0′		56° 45′		56° 30′		56° 15′		

Dist.	34° 0′		34° 15′		34° 30′		34° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.83	0.56	0.83	0.56	0.82	0.57	0.82	0.57	1
2	1.66	1.12	1.65	1.13	1.65	1.13	1.64	1.14	2
3	2.49	1.68	2.48	1.69	2.47	1.70	2.46	1.71	3
4	3.32	2.24	3.31	2.25	3.30	2.27	3.29	2.28	4
5	4.15	2.80	4.13	2.81	4.12	2.83	4.11	2.85	5
6	4.97	3.36	4.96	3.38	4.94	3.40	4.93	3.42	6
7	5.80	3.91	5.79	3.94	5.77	3.96	5.75	3.99	7
8	6.63	4.47	6.61	4.50	6.59	4.53	6.57	4.56	8
9	7.46	5.03	7.44	5.07	7.42	5.10	7.39	5.13	9
10	8.29	5.59	8.27	5.63	8.24	5.66	8.22	5.70	10
11	9.12	6.15	9.09	6.19	9.07	6.23	9.04	6.27	11
12	9.95	6.71	9.92	6.75	9.89	6.80	9.86	6.84	12
13	10.78	7.27	10.75	7.32	10.71	7.36	10.68	7.41	13
14	11.61	7.83	11.57	7.88	11.54	7.93	11.50	7.98	14
15	12.44	8.39	12.40	8.44	12.36	8.50	12.32	8.55	15
16	13.26	8.95	13.23	9.00	13.19	9.06	13.15	9.12	16
17	14.09	9.51	14.05	9.57	14.01	9.63	13.97	9.69	17
18	14.92	10.07	14.88	10.13	14.83	10.20	14.79	10.29	18
19	15.75	10.62	15.71	10.69	15.66	10.76	15.61	10.83	19
20	16.58	11.18	16.53	11.26	16.48	11.33	16.43	11.40	20
21	17.41	11.74	17.36	11.82	17.31	11.89	17.25	11.97	21
22	18.24	12.30	18.18	12.38	18.13	12.46	18.08	12.54	22
23	19.07	12.86	19.01	12.94	18.95	13.03	18.90	13.11	23
24	19.90	13.42	19.84	13.51	19.78	13.59	19.72	13.68	24
25	20.73	13.98	20.66	14.07	20.60	14.16	20.54	14.25	25
26	21.56	14.54	21.49	14.63	21.43	14.73	21.36	14.82	26
27	22.38	15.10	22.32	15.20	22.25	15.29	22.18	15.39	27
28	23.21	15.66	23.14	15.76	23.08	15.86	23.01	15.96	28
29	24.04	16.22	23.97	16.32	23.90	16.43	23.83	16.53	29
30	24.87	16.78	24.80	16.88	24.72	16.99	24.65	17.10	30
31	25.70	17.33	25.62	17.45	25.55	17.56	25.47	17.67	31
32	26.53	17.89	26.45	18.01	26.37	18.13	26.29	18.24	32
33	27.36	18.45	27.28	18.57	27.20	18.69	27.11	18.81	33
34	28.19	19.01	28.10	19.14	28.02	19.26	27.94	19.38	34
35	29.02	19.57	28.93	19.70	28.84	19.82	28.76	19.95	35
36	29.85	20.13	29.76	20.26	29.67	20.39	29.58	20.52	36
37	30.67	20.69	30.58	20.82	30.49	20.96	30.40	21.09	37
38	31.50	21.25	31.41	21.39	31.32	21.52	31.22	21.66	38
39	32.33	21.81	32.24	21.95	32.14	22.09	32.04	22.23	39
40	33.16	22.37	33.06	22.51	32.97	22.66	32.87	22.80	40
41	33.99	22.93	33.89	23.07	33.79	23.22	33.69	23.37	41
42	34.82	23.49	34.72	23.64	34.61	23.79	34.51	23.94	42
43	35.65	24.05	35.54	24.20	35.44	24.36	35.33	24.51	43
44	36.48	24.60	36.37	24.76	36.26	24.92	36.15	25.08	44
45	37.31	25.16	37.20	25.33	37.09	25.49	36.97	25.65	45
46	38.14	25.72	38.02	25.89	37.91	26.05	37.80	26.22	46
47	38.96	26.28	38.85	26.45	38.73	26.62	38.62	26.79	47
48	39.79	26.84	39.68	27.01	39.56	27.19	39.44	27.36	48
49	40.62	27.40	40.50	27.58	40.38	27.75	40.26	27.93	49
50	41.45	27.96	41.33	28.14	41.21	28.32	41.08	28.50	50
51	42.28	28.52	42.16	28.70	42.03	28.89	41.90	29.07	51
52	43.11	29.08	42.98	29.27	42.85	29.45	42.73	29.64	52
53	43.94	29.64	43.81	29.83	43.68	30.02	43.55	30.21	53
54	44.77	30.20	44.64	30.39	44.50	30.58	44.37	30.78	54
55	45.60	30.75	45.46	30.95	45.33	31.15	45.19	31.35	55
56	46.43	31.31	46.29	31.52	46.15	31.72	46.01	31.92	56
57	47.25	31.87	47.12	32.08	46.97	32.28	46.84	32.49	57
58	48.08	32.43	47.95	32.64	47.80	32.85	47.66	33.06	58
59	48.91	32.99	48.77	33.20	48.62	33.41	48.48	33.63	59
60	49.74	33.55	49.60	33.77	49.45	33.98	49.30	34.20	60
61	50.57	34.11	50.42	34.33	50.27	34.55	50.12	34.77	61
62	51.40	34.67	51.25	34.89	51.10	35.12	50.94	35.34	62
63	52.23	35.23	52.08	35.46	51.92	35.68	51.76	35.91	63
64	53.06	35.79	52.90	36.02	52.74	36.25	52.59	36.48	64
65	53.89	36.35	53.73	36.58	53.56	36.81	53.41	37.05	65
66	54.72	36.90	54.56	37.15	54.39	37.38	54.23	37.62	66
67	55.54	37.46	55.38	37.71	55.22	37.95	55.05	38.19	67
68	56.37	38.02	56.21	38.27	56.04	38.51	55.87	38.76	68
69	57.20	38.58	57.04	38.83	56.86	39.08	56.70	39.33	69
70	58.03	39.14	57.86	39.40	57.69	39.65	57.52	39.90	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	56° 0′		55° 45′		55° 30′		55° 15′		

Dist.	35° 0′		35° 15′		35° 30′		35° 45′		Dist
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.82	0.57	0.82	0.58	0.81	0.58	0.81	0.58	1
2	1.64	1.15	1.63	1.15	1.63	1.16	1.62	1.17	2
3	2.46	1.72	2.45	1.73	2.44	1.74	2.43	1.75	3
4	3.28	2.29	3.27	2.31	3.26	2.32	3.25	2.34	4
5	4.10	2.87	4.08	2.89	4.07	2.90	4.06	2.92	5
6	4.91	3.44	4.90	3.46	4.88	3.48	4.87	3.51	6
7	5.73	4.02	5.72	4.04	5.70	4.06	5.68	4.09	7
8	6.55	4.59	6.53	4.62	6.51	4.65	6.49	4.67	8
9	7.37	5.16	7.35	5.19	7.33	5.23	7.30	5.26	9
10	8.19	5.74	8.17	5.77	8.14	5.81	8.12	5.84	10
11	9.01	6.31	8.98	6.35	8.96	6.39	8.93	6.43	11
12	9.83	6.88	9.80	6.93	9.77	6.97	9.74	7.01	12
13	10.65	7.46	10.62	7.50	10.58	7.55	10.55	7.60	13
14	11.47	8.03	11.43	8.08	11.40	8.13	11.36	8.18	14
15	12.29	8.60	12.25	8.66	12.21	8.71	12.17	8.76	15
16	13.11	9.18	13.07	9.23	13.03	9.29	12.99	9.35	16
17	13.93	9.75	13.88	9.81	13.84	9.87	13.80	9.93	17
18	14.74	10.32	14.70	10.39	14.65	10.45	14.61	10.52	18
19	15.56	10.90	15.52	10.97	15.47	11.03	15.42	11.10	19
20	16.38	11.47	16.33	11.54	16.28	11.61	16.23	11.68	20
21	17.20	12.05	17.15	12.12	17.10	12.19	17.04	12.27	21
22	18.02	12.62	17.97	12.70	17.91	12.78	17.85	12.85	22
23	18.84	13.19	18.78	13.27	18.72	13.36	18.67	13.44	23
24	19.66	13.77	19.60	13.85	19.54	13.94	19.48	14.02	24
25	20.48	14.34	20.42	14.43	20.35	14.52	20.29	14.61	25
26	21.30	14.91	21.23	15.01	21.17	15.10	21.10	15.19	26
27	22.12	15.49	22.05	15.58	21.98	15.68	21.91	16.77	27
28	22.94	16.06	22.87	16.16	22.80	16.26	22.72	16.36	28
29	23.76	16.63	23.68	16.74	23.61	16.84	23.54	16.94	29
30	24.57	17.21	24.50	17.31	24.42	17.42	24.35	17.53	30
31	25.39	17.78	25.32	17.89	25.24	18.00	25.16	18.11	31
32	26.21	18.35	26.13	18.47	26.05	18.58	25.97	18.70	32
33	27.03	18.93	26.95	19.05	26.87	19.16	26.78	19.28	33
34	27.85	19.50	27.77	19.62	27.68	19.74	27.59	19.86	34
35	28.67	20.08	28.58	20.20	28.49	20.32	28.40	20.45	35
36	29.49	20.65	29.40	20.78	29.31	20.91	29.22	21.03	36
37	30.31	21.22	30.22	21.35	30.12	21.49	30.03	21.62	37
38	31.13	21.80	31.03	21.93	30.94	22.07	30.84	22.20	38
39	31.95	22.37	31.85	22.51	31.75	22.65	31.65	22.79	39
40	32.77	22.94	32.67	23.09	32.56	23.23	32.46	23.37	40
41	33.59	23.52	33.48	23.66	33.38	23.81	33.27	23.95	41
42	34.40	24.09	34.30	24.24	34.19	24.39	34.09	24.54	42
43	35.22	24.66	35.12	24.82	35.01	24.97	34.90	25.12	43
44	36.04	25.24	35.93	25.39	35.82	25.55	35.71	25.71	44
45	36.86	25.81	36.75	25.97	36.64	26.13	36.52	26.29	45
46	37.68	26.38	37.57	26.55	37.45	26.71	37.33	26.88	46
47	38.50	26.96	38.38	27.13	38.26	27.29	38.14	27.46	47
48	39.32	27.53	39.20	27.70	39.08	27.87	38.96	28.04	48
49	40.14	28.11	40.02	28.28	39.89	28.45	39.77	28.63	49
50	40.96	28.68	40.83	28.86	40.71	29.04	40.58	29.21	50
51	41.78	29.25	41.65	29.43	41.52	29.62	41.39	29.80	51
52	42.60	29.83	42.47	30.01	42.33	30.20	42.20	30.38	52
53	43.41	30.40	43.28	30.59	43.15	30.78	43.01	30.96	53
54	44.23	30.97	44.10	31.17	43.96	31.36	43.83	31.55	54
55	45.05	31.55	44.92	31.74	44.78	31.94	44.64	32.13	55
56	45.87	32.12	45.73	32.32	45.59	32.52	45.45	32.72	56
57	46.69	32.70	46.55	32.90	46.40	33.10	46.26	33.30	57
58	47.51	33.27	47.37	33.47	47.22	33.68	47.07	33.88	58
59	48.33	33.84	48.18	34.05	48.03	34.26	47.89	34.47	59
60	49.15	34.41	49.00	34.63	48.85	34.84	48.69	35.05	60
61	49.97	34.99	49.81	35.21	49.66	35.42	49.51	35.64	61
62	50.79	35.56	50.63	35.78	50.47	36.00	50.32	36.22	62
63	51.61	36.14	51.45	36.37	51.29	36.58	51.13	36.81	63
64	52.42	36.71	52.27	36.94	52.10	37.17	51.94	37.39	64
65	53.24	37.28	53.07	37.51	52.92	37.75	52.75	37.98	65
66	54.06	37.86	53.90	38.09	53.73	38.33	53.56	38.56	66
67	54.88	38.43	54.72	38.67	54.54	38.91	54.38	39.14	67
68	55.70	39.01	55.53	39.24	55.36	39.49	55.19	39.73	68
69	56.52	39.58	56.35	39.82	56.17	40.07	56.00	40.31	69
70	57.34	40.15	57.16	40.40	56.99	40.65	56.81	40.89	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	55° 0′		54° 45′		54° 30′		54° 15′		

Dist.	36° 0'		36° 15'		36° 30'		36° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.81	0.59	0.81	0.59	0.80	0.59	0.80	0.60	1
2	1.62	1.18	1.61	1.18	1.61	1.19	1.60	1.20	2
3	2.43	1.76	2.42	1.77	2.41	1.78	2.40	1.79	3
4	3.24	2.35	3.23	2.37	3.22	2.38	3.20	2.39	4
5	4.05	2.94	4.03	2.96	4.02	2.97	4.01	2.99	5
6	4.85	3.53	4.84	3.55	4.82	3.57	4.81	3.59	6
7	5.66	4.11	5.65	4.14	5.63	4.16	5.61	4.19	7
8	6.47	4.70	6.45	4.73	6.43	4.76	6.41	4.79	8
9	7.28	5.29	7.26	5.32	7.23	5.35	7.21	5.38	9
10	8.09	5.88	8.06	5.91	8.04	5.95	8.01	5.98	10
11	8.90	6.47	8.87	6.50	8.84	6.54	8.81	6.58	11
12	9.71	7.05	9.68	7.10	9.65	7.14	9.61	7.18	12
13	10.52	7.64	10.48	7.69	10.45	7.73	10.42	7.78	13
14	11.33	8.23	11.29	8.28	11.25	8.33	11.22	8.38	14
15	12.14	8.82	12.10	8.87	12.06	8.92	12.02	8.97	15
16	12.94	9.40	12.90	9.46	12.86	9.52	12.82	9.57	16
17	13.75	9.99	13.71	10.05	13.67	10.11	13.62	10.17	17
18	14.56	10.58	14.52	10.64	14.47	10.71	14.42	10.77	18
19	15.37	11.17	15.32	11.23	15.27	11.30	15.22	11.37	19
20	16.18	11.76	16.13	11.83	16.08	11.90	16.02	11.97	20
21	16.99	12.34	16.94	12.42	16.88	12.49	16.83	12.56	21
22	17.80	12.93	17.74	13.01	17.68	13.09	17.63	13.16	22
23	18.61	13.52	18.55	13.60	18.49	13.68	18.43	13.76	23
24	19.42	14.11	19.35	14.19	19.29	14.28	19.23	14.36	24
25	20.23	14.69	20.16	14.78	20.10	14.87	20.03	14.96	25
26	21.03	15.28	20.97	15.37	20.90	15.47	20.83	15.56	26
27	21.84	15.87	21.77	15.97	21.70	16.06	21.63	16.15	27
28	22.65	16.46	22.58	16.56	22.51	16.65	22.43	16.75	28
29	23.46	17.05	23.39	17.15	23.31	17.25	23.24	17.35	29
30	24.27	17.63	24.19	17.74	24.12	17.84	24.04	17.95	30
31	25.08	18.22	25.00	18.33	24.92	18.44	24.84	18.55	31
32	25.89	18.81	25.81	18.92	25.72	19.03	25.64	19.15	32
33	26.70	19.40	26.61	19.51	26.53	19.63	26.44	19.74	33
34	27.51	19.98	27.42	20.10	27.33	20.22	27.24	20.34	34
35	28.32	20.57	28.23	20.70	28.14	20.82	28.04	20.94	35
36	29.12	21.16	29.03	21.29	28.94	21.41	28.84	21.54	36
37	29.93	21.75	29.84	21.88	29.74	22.01	29.65	22.14	37
38	30.74	22.34	30.64	22.47	30.55	22.60	30.45	22.74	38
39	31.55	22.92	31.45	23.06	31.35	23.20	31.25	23.33	39
40	32.36	23.51	32.26	23.65	32.15	23.79	32.05	23.93	40
41	33.17	24.10	33.06	24.24	32.96	24.39	32.85	24.53	41
42	33.98	24.69	33.87	24.84	33.76	24.98	33.65	25.13	42
43	34.79	25.27	34.68	25.43	34.57	25.58	34.45	25.73	43
44	35.60	25.86	35.48	26.02	35.37	26.17	35.25	26.33	44
45	36.41	26.45	36.29	26.61	36.17	26.77	36.06	26.92	45
46	37.21	27.04	37.10	27.20	36.98	27.36	36.86	27.52	46
47	38.02	27.63	37.90	27.79	37.78	27.96	37.66	28.12	47
48	38.83	28.21	38.71	28.38	38.59	28.55	38.46	28.72	48
49	39.64	28.80	39.52	28.97	39.39	29.15	39.26	29.32	49
50	40.45	29.39	40.32	29.57	40.19	29.74	40.06	29.92	50
51	41.26	29.98	41.13	30.16	41.00	30.34	40.86	30.51	51
52	42.07	30.57	41.93	30.75	41.80	30.93	41.66	31.11	52
53	42.88	31.15	42.74	31.34	42.60	31.53	42.47	31.71	53
54	43.68	31.74	43.55	31.93	43.41	32.12	43.27	32.31	54
55	44.49	32.33	44.35	32.52	44.21	32.72	44.07	32.91	55
56	45.30	32.91	45.16	33.11	45.02	33.31	44.87	33.51	56
57	46.11	33.49	45.96	33.70	45.82	33.91	45.67	34.11	57
58	46.92	34.08	46.77	34.29	46.62	34.50	46.47	34.70	58
59	47.73	34.67	47.58	34.88	47.43	35.10	47.27	35.30	59
60	48.54	35.26	48.39	35.48	48.23	35.69	48.07	35.90	60
61	49.35	35.85	49.19	36.07	49.04	36.28	48.88	36.50	61
62	50.16	36.43	49.99	36.66	49.84	36.88	49.68	37.09	62
63	50.97	37.03	50.80	37.25	50.64	37.47	50.48	37.69	63
64	51.78	37.62	51.61	37.84	51.45	38.07	51.28	38.29	64
65	52.59	38.21	52.42	38.44	52.25	38.66	52.08	38.89	65
66	53.39	38.79	53.22	39.03	53.06	39.26	52.88	39.49	66
67	54.20	39.38	54.03	39.62	53.86	39.85	53.68	40.08	67
63	55.01	39.97	54.84	40.21	54.66	40.45	54.48	40.68	68
69	55.82	40.56	55.65	40.80	55.47	41.04	55.28	41.28	69
70	56.63	41.14	56.45	41.39	56.27	41.64	56.09	41.88	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat	Dep.	Lat.	Dist.
	54° 0'		53° 45'		53° 30'		53° 15'		

Dist.	37° 0'		37° 15'		37° 30'		37° 45'		Dist.
	Lat	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.80	0.60	0.80	0.61	0.79	0.61	0.79	0.61	1
2	1.60	1.20	1.59	1.21	1.59	1.22	1.58	1.22	2
3	2.40	1.81	2.39	1.82	2.38	1.83	2.37	1.84	3
4	3.19	2.41	3.18	2.42	3.17	2.44	3.16	2.45	4
5	3.99	3.01	3.98	3.03	3.97	3.04	3.95	3.06	5
6	4.79	3.61	4.78	3.63	4.76	3.65	4.74	3.67	6
7	5.59	4.21	5.57	4.24	5.55	4.26	5.53	4.29	7
8	6.39	4.81	6.37	4.84	6.35	4.87	6.33	4.90	8
9	7.19	5.42	7.16	5.45	7.14	5.48	7.12	5.51	9
10	7.99	6.02	7.96	6.05	7.93	6.09	7.91	6.12	10
11	8.79	6.62	8.76	6.66	8.73	6.70	8.70	6.73	11
12	9.58	7.22	9.55	7.26	9.52	7.31	9.49	7.35	12
13	10.38	7.82	10.35	7.87	10.31	7.91	10.28	7.96	13
14	11.18	8.43	11.14	8.47	11.11	8.52	11.07	8.57	14
15	11.98	9.03	11.94	9.08	11.90	9.13	11.86	9.18	15
16	12.78	9.63	12.74	9.68	12.69	9.74	12.65	9.80	16
17	13.58	10.23	13.53	10.29	13.49	10.35	13.44	10.41	17
18	14.38	10.83	14.33	10.90	14.28	10.96	14.23	11.02	18
19	15.17	11.43	15.12	11.50	15.07	11.57	15.02	11.63	19
20	15.97	12.04	15.92	12.11	15.87	12.18	15.81	12.24	20
21	16.77	12.64	16.72	12.71	16.66	12.78	16.60	12.86	21
22	17.57	13.24	17.51	13.32	17.45	13.39	17.40	13.47	22
23	18.37	13.84	18.31	13.92	18.25	14.00	18.19	14.08	23
24	19.17	14.44	19.10	14.53	19.04	14.61	18.98	14.69	24
25	19.97	15.05	19.90	15.13	19.83	15.22	19.77	15.31	25
26	20.76	15.65	20.70	15.74	20.63	15.83	20.56	15.92	26
27	21.56	16.25	21.49	16.34	21.42	16.44	21.35	16.53	27
28	22.36	16.85	22.29	16.95	22.21	17.05	22.14	17.14	28
29	23.16	17.45	23.08	17.55	23.01	17.65	22.93	17.75	29
30	23.96	18.05	23.88	18.16	23.80	18.26	23.72	18.37	30
31	24.76	18.66	24.68	18.76	24.59	18.87	24.51	18.98	31
32	25.56	19.26	25.47	19.37	25.39	19.48	25.30	19.59	32
33	26.36	19.86	26.27	19.97	26.18	20.09	26.09	20.20	33
34	27.15	20.46	27.06	20.58	26.97	20.70	26.88	20.82	34
35	27.95	21.06	27.86	21.19	27.77	21.31	27.67	21.43	35
36	28.75	21.67	28.66	21.79	28.56	21.92	28.46	22.04	36
37	29.55	22.27	29.45	22.40	29.35	22.52	29.26	22.65	37
38	30.35	22.87	30.25	23.00	30.15	23.13	30.05	23.26	38
39	31.15	23.47	31.04	23.61	30.94	23.74	30.84	23.88	39
40	31.95	24.07	31.84	24.21	31.73	24.35	31.63	24.49	40
41	32.74	24.67	32.64	24.82	32.53	24.96	32.42	25.10	41
42	33.54	25.28	33.43	25.42	33.32	25.57	33.21	25.71	42
43	34.34	25.88	34.23	26.03	34.11	26.18	34.00	26.33	43
44	35.14	26.48	35.02	26.63	34.91	26.79	34.79	26.94	44
45	35.94	27.08	35.82	27.24	35.70	27.39	35.58	27.55	45
46	36.74	27.68	36.62	27.84	36.49	28.00	36.37	28.16	46
47	37.54	28.29	37.41	28.45	37.29	28.61	37.16	28.77	47
48	38.33	28.89	38.21	29.05	38.08	29.22	37.95	29.39	48
49	39.13	29.49	39.00	29.66	38.87	29.83	38.74	30.00	49
50	39.93	30.09	39.80	30.26	39.67	30.44	39.53	30.61	50
51	40.73	30.69	40.60	30.87	40.46	31.05	40.33	31.22	51
52	41.52	31.29	41.39	31.47	41.25	31.66	41.12	31.83	52
53	42.32	31.90	42.19	32.08	42.05	32.26	41.91	32.45	53
54	43.12	32.50	42.98	32.68	42.84	32.87	42.70	33.06	54
55	43.92	33.10	43.78	33.29	43.63	33.48	43.49	33.67	55
56	44.72	33.70	44.58	33.89	44.43	34.09	44.28	34.28	56
57	45.52	34.30	45.37	34.50	45.22	34.70	45.07	34.89	57
58	46.32	34.91	46.17	35.10	46.01	35.31	45.86	35.51	58
59	47.12	35.51	46.96	35.71	46.80	35.92	46.65	36.12	59
60	47.92	36.11	47.76	36.32	47.60	36.53	47.44	36.73	60
61	48.72	36.71	48.56	36.92	48.39	37.13	48.23	37.34	61
62	49.52	37.31	49.35	37.54	49.19	37.74	49.02	37.96	62
63	50.31	37.91	50.15	38.13	49.98	38.35	49.81	38.57	63
64	51.11	38.52	50.94	38.74	50.77	38.96	50.60	39.18	64
65	51.91	39.12	51.74	39.34	51.57	39.57	51.40	39.79	65
66	52.71	39.72	52.54	39.95	52.36	40.18	52.19	40.40	66
67	53.51	40.32	53.33	40.55	53.15	40.79	52.98	41.02	67
68	54.31	40.92	54.13	41.16	53.94	41.40	53.77	41.63	68
69	55.11	41.53	54.92	41.76	54.74	42.00	54.56	42.24	69
70	55.90	42.13	55.72	42.37	55.53	42.61	55.35	42.85	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	53° 0'		52° 45'		52° 30'		52° 15'		

Dist.	38° 0′		38° 15′		38° 30′		38° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.79	0.62	0.79	0.62	0.78	0.62	0.78	0.63	1
2	1.58	1.23	1.57	1.24	1.57	1.25	1.56	1.25	2
3	2.36	1.85	2.36	1.86	2.35	1.87	2.34	1.88	3
4	3.15	2.46	3.14	2.48	3.13	2.49	3.12	2.50	4
5	3.94	3.08	3.93	3.10	3.91	3.11	3.90	3.13	5
6	4.73	3.69	4.71	3.71	4.70	3.74	4.68	3.76	6
7	5.52	4.31	5.50	4.33	5.48	4.36	5.46	4.38	7
8	6.30	4.93	6.28	4.95	6.26	4.98	6.24	5.01	8
9	7.09	5.54	7.07	5.57	7.04	5.60	7.02	5.63	9
10	7.88	6.16	7.85	6.19	7.83	6.23	7.80	6.26	10
11	8.67	6.77	8.64	6.81	8.61	6.85	8.58	6.89	11
12	9.46	7.39	9.42	7.43	9.39	7.47	9.36	7.51	12
13	10.24	8.00	10.21	8.05	10.17	8.09	10.14	8.14	13
14	11.03	8.62	10.99	8.67	10.96	8.72	10.92	8.76	14
15	11.82	9.23	11.78	9.29	11.74	9.34	11.70	9.39	15
16	12.61	9.85	12.57	9.91	12.52	9.96	12.48	10.01	16
17	13.40	10.47	13.35	10.52	13.30	10.58	13.26	10.64	17
18	14.18	11.08	14.14	11.14	14.09	11.21	14.04	11.27	18
19	14.97	11.70	14.92	11.76	14.87	11.83	14.82	11.89	19
20	15.76	12.31	15.71	12.38	15.65	12.45	15.60	12.52	20
21	16.55	12.93	16.49	13.00	16.43	13.07	16.38	13.14	21
22	17.34	13.54	17.28	13.62	17.22	13.70	17.16	13.77	22
23	18.12	14.16	18.06	14.24	18.00	14.32	17.94	14.40	23
24	18.91	14.78	18.85	14.86	18.78	14.94	18.72	15.02	24
25	19.70	15.39	19.63	15.48	19.57	15.56	19.50	15.65	25
26	20.49	16.01	20.42	16.10	20.35	16.19	20.28	16.27	26
27	21.28	16.62	21.20	16.72	21.13	16.81	21.06	16.90	27
28	22.06	17.24	21.99	17.33	21.91	17.43	21.84	17.53	28
29	22.85	17.85	22.77	17.95	22.70	18.05	22.62	18.15	29
30	23.64	18.47	23.56	18.57	23.48	18.68	23.40	18.78	30
31	24.43	19.09	24.34	19.19	24.26	19.30	24.18	19.40	31
32	25.22	19.70	25.13	19.81	25.04	19.92	24.96	20.03	32
33	26.00	20.32	25.92	20.43	25.83	20.54	25.74	20.66	33
34	26.79	20.93	26.70	21.05	26.61	21.17	26.52	21.28	34
35	27.58	21.55	27.49	21.67	27.39	21.79	27.30	21.91	35
36	28.37	22.16	28.27	22.29	28.17	22.41	28.08	22.53	36
37	29.16	22.78	29.06	22.91	28.96	23.03	28.86	23.16	37
38	29.94	23.40	29.84	23.53	29.74	23.66	29.64	23.78	38
39	30.73	24.01	30.63	24.14	30.52	24.28	30.42	24.41	39
40	31.52	24.63	31.41	24.76	31.30	24.90	31.20	25.04	40
41	32.31	25.24	32.20	25.38	32.09	25.52	31.98	25.66	41
42	33.10	25.86	32.98	26.00	32.87	26.15	32.75	26.29	42
43	33.88	26.47	33.77	26.62	33.65	26.77	33.53	26.91	43
44	34.67	27.09	34.55	27.24	34.43	27.39	34.31	27.54	44
45	35.46	27.70	35.34	27.86	35.22	28.01	35.09	28.17	45
46	36.25	28.32	36.12	28.48	36.00	28.64	35.87	28.79	46
47	37.04	28.94	36.91	29.10	36.78	29.26	36.65	29.42	47
48	37.82	29.55	37.70	29.72	37.57	29.88	37.43	30.04	48
49	38.61	30.17	38.48	30.34	38.35	30.50	38.21	30.67	49
50	39.40	30.78	39.27	30.95	39.13	31.13	38.99	31.30	50
51	40.19	31.40	40.05	31.57	39.91	31.75	39.77	31.92	51
52	40.98	32.02	40.84	32.19	40.70	32.37	40.55	32.55	52
53	41.77	32.63	41.62	32.81	41.48	33.00	41.33	33.17	53
54	42.55	33.25	42.41	33.43	42.26	33.62	42.11	33.80	54
55	43.34	33.86	43.19	34.05	43.05	34.24	42.89	34.43	55
56	44.13	34.48	43.98	34.67	43.83	34.86	43.67	35.05	56
57	44.92	35.10	44.76	35.29	44.61	35.49	44.45	35.68	57
58	45.71	35.71	45.55	35.91	45.39	36.11	45.23	36.30	58
59	46.49	36.33	46.33	36.53	46.18	36.73	46.01	36.93	59
60	47.28	36.94	47.12	37.15	46.96	37.35	46.79	37.56	60
61	48.07	37.56	47.90	37.76	47.74	37.97	47.57	38.18	61
62	48.87	38.17	48.69	38.38	48.52	38.60	48.35	38.81	62
63	49.65	38.79	49.47	39.00	49.31	39.22	49.13	39.43	63
64	50.43	39.40	50.26	39.62	50.09	39.84	49.91	40.06	64
65	51.22	40.02	51.04	40.24	50.87	40.47	50.69	40.69	65
66	52.01	40.64	51.83	40.86	51.66	41.09	51.47	41.31	66
67	52.80	41.25	52.61	41.48	52.44	41.71	52.25	41.94	67
68	53.59	41.87	53.40	42.10	53.22	42.34	53.04	42.56	68
69	54.37	42.48	54.18	42.72	54.00	42.96	53.81	43.19	69
70	55.16	43.10	54.97	43.34	54.78	43.58	54.59	43.81	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	52° 0′		51° 45′		51° 30′		51° 15′		

Dist.	39° 0′		39° 15′		39° 30′		39° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.78	0.63	0.77	0.63	0.77	0.64	0.77	0.64	1
2	1.55	1.26	1.55	1.27	1.54	1.27	1.54	1.28	2
3	2.33	1.89	2.32	1.90	2.31	1.91	2.31	1.92	3
4	3.11	2.52	3.10	2.53	3.09	2.54	3.08	2.56	4
5	3.89	3.15	3.87	3.16	3.86	3.18	3.84	3.20	5
6	4.66	3.78	4.65	3.80	4.63	3.82	4.61	3.84	6
7	5.44	4.41	5.42	4.43	5.40	4.45	5.38	4.48	7
8	6.22	5.03	6.20	5.06	6.17	5.09	6.15	5.12	8
9	6.99	5.66	6.97	5.69	6.94	5.72	6.92	5.76	9
10	7.77	6.29	7.74	6.33	7.72	6.36	7.69	6.39	10
11	8.55	6.92	8.52	6.96	8.49	7.00	8.46	7.03	11
12	9.33	7.55	9.29	7.59	9.26	7.63	9.23	7.67	12
13	10.10	8.18	10.07	8.23	10.03	8.27	9.99	8.31	13
14	10.88	8.81	10.84	8.86	10.80	8.91	10.76	8.95	14
15	11.66	9.44	11.62	9.49	11.57	9.54	11.55	9.59	15
16	12.43	10.07	12.39	10.12	12.35	10.18	12.30	10.23	16
17	13.21	10.70	13.16	10.76	13.12	10.81	13.07	10.87	17
18	13.99	11.33	13.94	11.39	13.89	11.45	13.84	11.51	18
19	14.77	11.96	14.71	12.02	14.66	12.09	14.61	12.15	19
20	15.54	12.59	15.49	12.65	15.43	12.72	15.38	12.79	20
21	16.32	13.22	16.26	13.29	16.20	13.36	16.15	13.43	21
22	17.10	13.84	17.04	13.92	16.98	13.99	16.91	14.07	22
23	17.87	14.47	17.81	14.55	17.75	14.63	17.68	14.71	23
24	18.65	15.10	18.59	15.19	18.52	15.27	18.45	15.35	24
25	19.43	15.73	19.36	15.82	19.29	15.90	19.22	15.99	25
26	20.21	16.36	20.13	16.45	20.06	16.54	19.99	16.63	26
27	20.98	16.99	20.91	17.08	20.83	17.17	20.76	17.26	27
28	21.76	17.62	21.68	17.72	21.61	17.81	21.53	17.90	28
29	22.54	18.25	22.46	18.35	22.38	18.45	22.30	18.54	29
30	23.31	18.88	23.23	18.98	23.15	19.08	23.07	19.18	30
31	24.09	19.51	24.01	19.61	23.92	19.72	23.83	19.82	31
32	24.87	20.14	24.78	20.25	24.69	20.35	24.60	20.46	32
33	25.65	20.77	25.55	20.88	25.46	20.99	25.37	21.10	33
34	26.42	21.40	26.33	21.51	26.24	21.63	26.14	21.74	34
35	27.20	22.03	27.10	22.14	27.01	22.26	26.91	22.38	35
36	27.98	22.66	27.88	22.78	27.78	22.90	27.68	23.02	36
37	28.75	23.28	28.65	23.41	28.55	23.53	28.45	23.66	37
38	29.53	23.91	29.43	24.04	29.32	24.17	29.22	24.30	38
39	30.31	24.54	30.20	24.68	30.09	24.81	29.98	24.94	39
40	31.09	25.17	30.98	25.31	30.86	25.44	30.75	25.58	40
41	31.86	25.80	31.75	25.94	31.64	26.08	31.52	26.22	41
42	32.64	26.43	32.52	26.57	32.41	26.72	32.29	26.86	42
43	33.42	27.06	33.30	27.21	33.18	27.35	33.06	27.50	43
44	34.19	27.69	34.07	27.84	33.95	27.99	33.83	28.14	44
45	34.97	28.32	34.85	28.47	34.72	28.62	34.60	28.77	45
46	35.75	28.95	35.62	29.10	35.49	29.26	35.37	29.41	46
47	36.53	29.58	36.40	29.74	36.27	29.90	36.14	30.05	47
48	37.30	30.21	37.17	30.37	37.04	30.53	36.90	30.69	48
49	38.08	30.84	37.95	31.00	37.81	31.17	37.67	31.33	49
50	38.86	31.47	38.72	31.64	38.58	31.80	38.44	31.97	50
51	39.63	32.10	39.49	32.27	39.35	32.44	39.21	32.61	51
52	40.41	32.72	40.27	32.90	40.13	33.08	39.98	33.25	52
53	41.19	33.35	41.04	33.54	40.90	33.71	40.75	33.89	53
54	41.97	33.98	41.82	34.17	41.67	34.34	41.52	34.53	54
55	42.74	34.61	42.59	34.80	42.45	34.98	42.29	35.17	55
56	43.52	35.24	43.36	35.43	43.21	35.62	43.06	35.81	56
57	44.30	35.87	44.15	36.07	43.99	36.26	43.83	36.45	57
58	45.07	36.50	44.91	36.70	44.76	36.89	44.59	37.08	58
59	45.85	37.13	45.70	37.33	45.53	37.53	45.36	37.72	59
60	46.63	37.76	46.46	37.96	46.30	38.17	46.13	38.37	60
61	47.41	38.39	47.24	38.60	47.07	38.80	46.90	39.01	61
62	48.18	39.02	48.01	39.23	47.84	39.43	47.67	39.64	62
63	48.96	39.65	48.79	39.86	48.61	40.07	48.44	40.29	63
64	49.74	40.28	49.56	40.50	49.39	40.70	49.21	40.92	64
65	50.51	40.90	50.34	41.13	50.16	41.35	49.98	41.56	65
66	51.29	41.64	51.11	41.76	50.93	41.98	50.75	42.20	66
67	52.07	42.16	51.88	42.39	51.70	42.62	51.51	42.84	67
68	52.85	42.79	52.66	43.03	52.47	43.25	52.28	43.48	68
69	53.52	43.42	53.43	43.66	53.24	43.89	53.05	44.12	69
70	54.40	44.05	54.21	44.29	54.01	44.58	53.82	44.76	70
Dist	Dep.	Lat.	Dep.	Lat.	Dep.	Lat	Dep	Lat.	Dist.
	51° 0′		50° 45′		50° 30′		50° 15′		

Dist.	40° 0′		40° 15′		40° 30′		40° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.77	0.64	0.76	0.65	0.76	0.65	0.76	0.65	1
2	1.53	1.29	1.53	1.29	1.52	1.30	1.52	1.31	2
3	2.30	1.93	2.29	1.94	2.28	1.95	2.27	1.96	3
4	3.06	2.57	3.05	2.58	3.04	2.60	3.03	2.61	4
5	3.83	3.21	3.82	3.23	3.80	3.25	3.79	3.26	5
6	4.60	3.86	4.58	3.88	4.56	3.90	4.55	3.92	6
7	5.36	4.50	5.34	4.52	5.32	4.55	5.30	4.57	7
8	6.13	5.14	6.11	5.17	6.08	5.20	6.06	5.22	8
9	6.89	5.79	6.87	5.82	6.84	5.85	6.82	5.87	9
10	7.66	6.43	7.63	6.46	7.60	6.49	7.58	6.53	10
11	8.43	7.07	8.40	7.11	8.36	7.14	8.33	7.18	11
12	9.19	7.71	9.16	7.75	9.12	7.79	9.09	7.83	12
13	9.96	8.36	9.92	8.40	9.89	8.44	9.85	8.49	13
14	10.72	9.00	10.69	9.05	10.65	9.09	10.61	9.14	14
15	11.49	9.64	11.45	9.69	11.41	9.74	11.36	9.79	15
16	12.26	10.28	12.21	10.34	12.17	10.39	12.12	10.44	16
17	13.02	10.93	12.97	10.99	12.93	11.04	12.88	11.10	17
18	13.79	11.57	13.74	11.63	13.69	11.69	13.64	11.75	18
19	14.55	12.21	14.50	12.28	14.45	12.34	14.39	12.40	19
20	15.32	12.86	15.26	12.92	15.21	12.99	15.15	13.06	20
21	16.09	13.50	16.03	13.57	15.97	13.64	15.91	13.71	21
22	16.85	14.14	16.79	14.21	16.73	14.29	16.67	14.36	22
23	17.62	14.78	17.55	14.86	17.49	14.94	17.42	15.01	23
24	18.38	15.43	18.32	15.51	18.25	15.59	18.18	15.67	24
25	19.15	16.07	19.08	16.15	19.01	16.24	18.94	16.32	25
26	19.92	16.71	19.84	16.80	19.77	16.89	19.70	16.97	26
27	20.68	17.36	20.61	17.45	20.53	17.54	20.45	17.62	27
28	21.45	18.00	21.37	18.09	21.29	18.18	21.21	18.28	28
29	22.22	18.64	22.13	18.74	22.05	18.83	21.97	18.93	29
30	22.98	19.28	22.90	19.38	22.81	19.48	22.73	19.58	30
31	23.75	19.93	23.66	20.03	23.57	20.13	23.48	20.24	31
32	24.51	20.57	24.42	20.68	24.33	20.78	24.24	20.89	32
33	25.28	21.21	25.19	21.32	25.09	21.43	25.00	21.54	33
34	26.05	21.85	25.95	21.97	25.85	22.08	25.76	22.19	34
35	26.81	22.50	26.71	22.61	26.61	22.73	26.51	22.85	35
36	27.58	23.14	27.48	23.26	27.37	23.38	27.27	23.50	36
37	28.34	23.78	28.24	23.91	28.14	24.03	28.03	24.15	37
38	29.11	24.43	29.00	24.55	28.90	24.68	28.79	24.80	38
39	29.88	25.07	29.77	25.20	29.66	25.33	29.54	25.46	39
40	30.64	25.71	30.53	25.84	30.42	25.98	30.30	26.11	40
41	31.41	26.35	31.29	26.49	31.18	26.63	31.06	26.76	41
42	32.17	27.00	32.06	27.14	31.94	27.28	31.82	27.42	42
43	32.94	27.64	32.82	27.78	32.70	27.93	32.58	28.07	43
44	33.71	28.28	33.58	28.43	33.46	28.58	33.33	28.72	44
45	34.47	28.93	34.35	29.08	34.22	29.23	34.09	29.37	45
46	35.24	29.57	35.11	29.72	34.98	29.87	34.85	30.03	46
47	36.00	30.21	35.87	30.37	35.74	30.52	35.61	30.68	47
48	36.77	30.85	36.64	31.01	36.50	31.17	36.36	31.33	48
49	37.54	31.50	37.40	31.66	37.26	31.82	37.12	31.99	49
50	38.30	32.14	38.16	32.31	38.02	32.47	37.88	32.64	50
51	39.07	32.78	38.93	32.95	38.78	33.12	38.64	33.29	51
52	39.83	33.43	39.69	33.60	39.54	33.77	39.39	33.94	52
53	40.60	34.07	40.45	34.24	40.30	34.42	40.15	34.60	53
54	41.37	34.71	41.21	34.89	41.06	35.07	40.91	35.25	54
55	42.13	35.35	41.98	35.54	41.82	35.72	41.67	35.90	55
56	42.90	36.00	42.74	36.18	42.58	36.37	42.43	36.56	56
57	43.66	36.64	43.50	36.83	43.34	37.02	43.19	37.21	57
58	44.43	37.28	44.27	37.47	44.10	37.67	43.95	37.86	58
59	45.20	37.93	45.03	38.12	44.86	38.32	44.70	38.52	59
60	45.96	38.57	45.79	38.77	45.62	38.97	45.45	39.17	60
61	46.73	39.21	46.56	39.41	46.38	39.62	46.21	39.82	61
62	47.49	39.85	47.32	40.06	47.15	40.27	46.97	40.47	62
63	48.26	40.50	48.08	40.71	47.91	40.91	47.73	41.13	63
64	49.03	41.14	48.85	41.35	48.67	41.56	48.49	41.78	64
65	49.79	41.78	49.61	42.00	49.43	42.21	49.24	42.43	65
66	50.56	42.43	50.37	42.64	50.19	42.86	50.00	43.08	66
67	51.32	42.07	51.14	43.29	50.95	43.51	50.76	43.74	67
68	52.09	43.71	51.90	43.94	51.71	44.16	51.52	44.39	68
69	52.86	44.35	52.66	44.58	52.47	44.81	52.28	45.04	69
70	53.62	45.00	53.43	45.23	53.23	45.46	53.04	45.69	70
Dist.	Dep	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	50° 0′		49° 45′		49° 30′		49° 15′		

Dist.	41° 0′		41° 15′		41° 30′		41° 45′		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.75	0.66	0.75	0.66	0.75	0.66	0.75	0.67	1
2	1.51	1.31	1.50	1.32	1.50	1.33	1.49	1.33	2
3	2.26	1.97	2.26	1.98	2.25	1.99	2.24	2.00	3
4	3.02	2.62	3.01	2.64	3.00	2.65	2.98	2.66	4
5	3.77	3.28	3.76	3.30	3.74	3.31	3.73	3.33	5
6	4.53	3.94	4.51	3.96	4.49	3.98	4.48	4.00	6
7	5.28	4.59	5.26	4.62	5.24	4.64	5.22	4.66	7
8	6.04	5.25	6.01	5.27	5.99	5.30	5.97	5.33	8
9	6.79	5.90	6.77	5.93	6.74	5.96	6.71	5.99	9
10	7.55	6.56	7.52	6.59	7.49	6.63	7.46	6.66	10
11	8.30	7.22	8.27	7.25	8.24	7.29	8.21	7.32	11
12	9.06	7.87	9.02	7.91	8.99	7.95	8.95	7.99	12
13	9.81	8.53	9.77	8.57	9.74	8.61	9.70	8.66	13
14	10.57	9.18	10.53	9.23	10.49	9.28	10.44	9.32	14
15	11.32	9.84	11.28	9.89	11.23	9.94	11.19	9.99	15
16	12.08	10.50	12.03	10.55	11.98	10.60	11.94	10.65	16
17	12.83	11.15	12.78	11.21	12.73	11.26	12.68	11.32	17
18	13.58	11.81	13.53	11.87	13.48	11.93	13.43	11.99	18
19	14.34	12.47	14.28	12.53	14.23	12.59	14.18	12.65	19
20	15.09	13.12	15.04	13.19	14.98	13.25	14.92	13.32	20
21	15.85	13.78	15.79	13.85	15.73	13.92	15.67	13.98	21
22	16.60	14.43	16.54	14.51	16.48	14.58	16.41	14.65	22
23	17.36	15.09	17.29	15.17	17.23	15.24	17.16	15.32	23
24	18.11	15.75	18.04	15.82	17.98	15.90	17.91	15.98	24
25	18.87	16.40	18.80	16.48	18.72	16.57	18.65	16.65	25
26	19.62	17.06	19.55	17.14	19.47	17.23	19.40	17.31	26
27	20.38	17.71	20.30	17.80	20.22	17.89	20.14	17.98	27
28	21.13	18.37	21.05	18.46	20.97	18.55	20.89	18.64	28
29	21.89	19.03	21.80	19.12	21.72	19.22	21.64	19.31	29
30	22.64	19.68	22.56	19.78	22.47	19.88	22.38	19.98	30
31	23.40	20.34	23.31	20.44	23.22	20.54	23.13	20.64	31
32	24.15	20.99	24.06	21.10	23.97	21.20	23.87	21.31	32
33	24.91	21.65	24.81	21.76	24.72	21.87	24.62	21.97	33
34	25.66	22.31	25.56	22.42	25.46	22.53	25.37	22.64	34
35	26.41	22.96	26.31	23.08	26.21	23.19	26.11	23.31	35
36	27.17	23.62	27.07	23.74	26.96	23.85	26.86	23.97	36
37	27.92	24.27	27.82	24.40	27.71	24.52	27,60	24.64	37
38	28.68	24.93	28.57	25.06	28.46	25.18	28.35	25.30	38
39	29.43	25.59	29.32	25.71	29.21	25.84	29.10	25.97	39
40	30.19	26.24	30.07	26.37	29.96	26.50	29.84	26.64	40
41	30.94	26.90	30.83	27.03	30.71	27.17	30,59	27.30	41
42	31.70	27.55	31.58	27.69	31.46	27.83	31.33	27.97	42
43	32.45	28.21	32.33	28.35	32.21	28.49	32.08	28.63	43
44	33.21	28.87	33.08	29.01	32.95	29.16	32.83	29.30	44
45	33.96	29.52	33.83	29.67	33.70	29.82	33.57	29.96	45
46	34.72	30.18	34.58	30.33	34.45	30.48	34.32	30.63	46
47	35.47	30.83	35.34	30.99	35.20	31.14	35.06	31.30	47
48	36.23	31.49	36.09	31.65	35.95	31.81	35.81	31.96	48
49	36.98	32.15	36.84	32.31	36.70	32.47	36.56	32.63	49
50	37.74	32.80	37.59	32.97	37.45	33.13	37.30	33.29	50
51	38.49	33.46	38.34	33.63	38.20	33.79	38.05	33.96	51
52	39.25	34.12	39.10	34.29	38.95	34.46	38.80	34.63	52
53	40.00	34.77	39.85	34.95	39.70	35.12	39.54	35.29	53
54	40.76	35.43	40.60	35.60	40.44	35.78	40.29	35.96	54
55	41.51	36.08	41.35	36.26	41.19	36.45	41.03	36.62	55
56	42.27	36.74	42.10	36.92	41.94	37.11	41.78	37.29	56
57	43.02	37.40	42.86	37.58	42.69	37.77	42.53	37.96	57
58	43.77	38.05	43.61	38.24	43.44	38.44	43.27	38.62	58
59	44.53	38.71	44.36	38.90	44.19	39.10	44.02	39.29	59
60	45.28	39.36	45.11	39.56	44.94	39.76	44.76	39.95	60
61	46.04	40.02	45.86	40.22	45.69	40.42	45.51	40.62	61
62	46.79	40.68	46.61	40.88	46.44	41.08	46.26	41.29	62
63	47.55	41.33	47.37	41.54	47.19	41.75	47.00	41.95	63
64	48.31	41.99	48.12	42.20	47.93	42.41	47.75	42.62	64
65	49.06	42.64	48.88	42.86	48.68	43.07	48.49	43.28	65
66	49.81	43.30	49.62	43.52	49.44	43.74	49.24	43.95	66
67	50.57	43.96	50.37	44.18	50.18	44.40	49.99	44.62	67
68	51.32	44.61	51.13	44.84	50.93	45.06	50.73	45.28	68
69	52.08	45.27	51.88	45.49	51.68	45.72	51.48	45.96	69
70	52.83	45.93	52.63	46.15	52.43	46.38	52.22	46.61	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	49° 0′		48° 45′		48° 30′		48° 15′		

Dist.	42° 0'		42° 15'		42° 30'		42° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.74	0.67	0.74	0.67	0.74	0.68	0.73	0.68	1
2	1.49	1.34	1.48	1.34	1.47	1.35	1.47	1.36	2
3	2.23	2.01	2.22	2.02	2.21	2.03	2.20	2.04	3
4	2.97	2.68	2.96	2.69	2.95	2.70	2.94	2.72	4
5	3.72	3.35	3.70	3.36	3.69	3.38	3.67	3.39	5
6	4.46	4.01	4.44	4.03	4.42	4.05	4.41	4.07	6
7	5.20	4.68	5.18	4.71	5.16	4.73	5.14	4.75	7
8	5.95	5.35	5.92	5.38	5.90	5.40	5.87	5.43	8
9	6.69	6.02	6.66	6.05	6.64	6.08	6.61	6.11	9
10	7.43	6.69	7.40	6.72	7.37	6.76	7.34	6.79	10
11	8.17	7.36	8.14	7.40	8.11	7.43	8.08	7.47	11
12	8.92	8.03	8.88	8.07	8.85	8.11	8.81	8.15	12
13	9.66	8.70	9.62	8.74	9.58	8.78	9.55	8.82	13
14	10.40	9.37	10.36	9.41	10.32	9.46	10.28	9.50	14
15	11.15	10.04	11.10	10.09	11.06	10.13	11.01	10.18	15
16	11.89	10.71	11.84	10.76	11.80	10.81	11.75	10.86	16
17	12.63	11.38	12.58	11.43	12.53	11.49	12.48	11.54	17
18	13.38	12.04	13.32	12.10	13.27	12.16	13.22	12.22	18
19	14.12	12.71	14.06	12.78	14.01	12.84	13.95	12.90	19
20	14.86	13.38	14.80	13.45	14.75	13.51	14.69	13.58	20
21	15.61	14.05	15.54	14.12	15.48	14.19	15.42	14.25	21
22	16.35	14.72	16.28	14.79	16.22	14.86	16.16	14.93	22
23	17.09	15.39	17.03	15.46	16.96	15.54	16.89	15.61	23
24	17.84	16.06	17.77	16.14	17.69	16.21	17.62	16.29	24
25	18.58	16.73	18.51	16.81	18.43	16.89	18.36	16.97	25
26	19.32	17.40	19.25	17.48	19.17	17.57	19.09	17.65	26
27	20.06	18.07	19.99	18.15	19.91	18.24	19.83	18.33	27
28	20.81	18.74	20.73	18.83	20.64	18.92	20.56	19.01	28
29	21.55	19.40	21.47	19.50	21.38	19.59	21.30	19.69	29
30	22.29	20.07	22.21	20.17	22.12	20.27	22.03	20.36	30
31	23.04	20.74	22.95	20.84	22.86	20.94	22.76	21.04	31
32	23.78	21.41	23.69	21.52	23.59	21.62	23.50	21.72	32
33	24.52	22.08	24.43	22.19	24.33	22.29	24.23	22.40	33
34	25.27	22.75	25.17	22.86	25.07	22.97	24.97	23.08	34
35	26.01	23.42	25.91	23.53	25.80	23.65	25.70	23.76	35
36	26.75	24.09	26.65	24.21	26.54	24.32	26.44	24.44	36
37	27.50	24.76	27.39	24.88	27.28	25.00	27.17	25.12	37
38	28.24	25.43	28.13	25.55	28.02	25.67	27.90	25.79	38
39	28.98	26.10	28.87	26.22	28.75	26.36	28.64	26.47	39
40	29.73	26.77	29.61	26.89	29.49	27.02	29.37	27.15	40
41	30.47	27.43	30.35	27.57	30.23	27.70	30.11	27.83	41
42	31.21	28.10	31.09	28.24	30.97	28.37	30.84	28.51	42
43	31.96	28.77	31.83	28.91	31.70	29.05	31.58	29.19	43
44	32.70	29.44	32.57	29.58	32.44	29.73	32.31	29.87	44
45	33.44	30.11	33.31	30.26	33.18	30.40	33.04	30.55	45
46	34.18	30.78	34.05	30.93	33.91	31.08	33.78	31.22	46
47	34.93	31.45	34.79	31.60	34.65	31.75	34.51	31.90	47
48	35.67	32.12	35.53	32.27	35.39	32.43	35.25	32.58	48
49	36.41	32.79	36.27	32.95	36.13	33.10	35.98	33.26	49
50	37.16	33.46	37.01	33.62	36.86	33.78	36.72	33.94	50
51	37.90	34.13	37.75	34.29	37.60	34.46	37.45	34.62	51
52	38.64	34.79	38.49	34.96	38.34	35.13	38.18	35.30	52
53	39.39	35.46	39.23	35.64	39.08	35.81	38.92	35.98	53
54	40.13	36.13	39.97	36.31	39.81	36.48	39.65	36.66	54
55	40.87	36.80	40.71	36.98	40.55	37.16	40.39	37.33	55
56	41.62	37.47	41.45	37.65	41.29	37.83	41.12	38.01	56
57	42.36	38.14	42.19	38.32	42.02	38.51	41.86	38.69	57
58	43.10	38.81	42.93	39.00	42.76	39.18	42.59	39.37	58
59	43.85	39.48	43.67	39.67	43.50	39.86	43.32	40.05	59
60	44.59	40.15	44.41	40.34	44.24	40.54	44.06	40.73	60
61	45.33	40.82	45.15	41.01	44.97	41.21	44.79	41.41	61
62	46.07	41.49	45.89	41.69	45.71	41.89	45.53	42.09	62
63	46.82	42.16	46.63	42.36	46.45	42.56	46.26	42.76	63
64	47.56	42.82	47.37	43.03	47.19	43.24	47.00	43.44	64
65	48.30	43.49	48.11	43.70	47.92	43.91	47.73	44.12	65
66	49.05	44.16	48.85	44.38	48.66	44.59	48.47	44.80	66
67	49.79	44.83	49.59	45.05	49.40	45.26	49.20	45.48	67
68	50.53	45.50	50.33	45.72	50.13	45.94	49.93	46.16	68
69	51.28	46.17	51.07	46.39	50.87	46.62	50.67	46.84	69
70	52.02	46.84	51.82	47.07	51.61	47.29	51.40	47.52	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	48° 0'		47° 45'		47° 30'		47° 15'		

Dist.	43° 0'		43° 15'		43° 30'		43° 45'		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
1	0.73	0.68	0.73	0.69	0.73	0.69	0.72	0.69	1
2	1.46	1.36	1.46	1.37	1.45	1.38	1.44	1.38	2
3	2.19	2.05	2.19	2.06	2.18	2.07	2.17	2.07	3
4	2.93	2.73	2.91	2.74	2.90	2.75	2.89	2.77	4
5	3.66	3.41	3.64	3.43	3.63	3.44	3.61	3.46	5
6	4.39	4.09	4.37	4.11	4.35	4.13	4.33	4.15	6
7	5.12	4.77	5.10	4.80	5.08	4.82	5.06	4.84	7
8	5.85	5.46	5.83	5.48	5.80	5.51	5.78	5.53	8
9	6.58	6.14	6.56	6.17	6.53	6.20	6.50	6.22	9
10	7.31	6.82	7.28	6.85	7.25	6.88	7.22	6.92	10
11	8.04	7.50	8.01	7.54	7.98	7.57	7.95	7.61	11
12	8.78	8.18	8.74	8.22	8.70	8.26	8.67	8.30	12
13	9.51	8.87	9.47	8.91	9.43	8.95	9.39	8.99	13
14	10.24	9.55	10.20	9.59	10.16	9.64	10.11	9.68	14
15	10.97	10.23	10.93	10.28	10.88	10.33	10.84	10.37	15
16	11.70	10.91	11.65	10.96	11.61	11.01	11.56	11.06	16
17	12.43	11.59	12.38	11.65	12.33	11.70	12.28	11.76	17
18	13.16	12.28	13.11	12.33	13.06	12.39	13.00	12.45	18
19	13.90	12.96	13.84	13.02	13.78	13.08	13.72	13.14	19
20	14.63	13.64	14.57	13.70	14.51	13.77	14.45	13.83	20
21	15.36	14.32	15.30	14.39	15.23	14.46	15.17	14.52	21
22	16.09	15.00	16.02	15.07	15.96	15.14	15.89	15.21	22
23	16.82	15.69	16.75	15.76	16.68	15.83	16.61	15.90	23
24	17.55	16.37	17.48	16.44	17.41	16.52	17.34	16.60	24
25	18.28	17.05	18.21	17.13	18.13	17.21	18.06	17.29	25
26	19.02	17.73	18.94	17.81	18.86	17.90	18.78	17.98	26
27	19.75	18.42	19.67	18.50	19.59	18.59	19.50	18.67	27
28	20.48	19.10	20.39	19.19	20.31	19.27	20.23	19.36	28
29	21.21	19.78	21.12	19.87	21.04	19.96	20.95	20.05	29
30	21.94	20.46	21.85	20.56	21.76	20.65	21.67	20.75	30
31	22.67	21.14	22.58	21.24	22.49	21.34	22.39	21.44	31
32	23.40	21.82	23.31	21.93	23.21	22.03	23.12	22.13	32
33	24.13	22.51	24.04	22.61	23.94	22.72	23.84	22.82	33
34	24.87	23.19	24.76	23.30	24.66	23.40	24.56	23.51	34
35	25.60	23.87	25.49	23.98	25.39	24.09	25.28	24.20	35
36	26.33	24.55	26.22	24.67	26.11	24.78	26.01	24.89	36
37	27.06	25.23	26.95	25.35	26.84	25.47	26.73	25.59	37
38	27.79	25.92	27.68	26.04	27.56	26.16	27.45	26.28	38
39	28.52	26.60	28.41	26.72	28.29	26.85	28.17	26.97	39
40	29.25	27.28	29.13	27.41	29.01	27.53	28.89	27.66	40
41	29.99	27.96	29.86	28.09	29.74	28.22	29.62	28.35	41
42	30.72	28.64	30.59	28.78	30.47	28.91	30.34	29.04	42
43	31.46	29.33	31.32	29.46	31.19	29.60	31.06	29.74	43
44	32.18	30.01	32.05	30.15	31.92	30.29	31.78	30.43	44
45	32.91	30.69	32.78	30.83	32.64	30.98	32.51	31.12	45
46	33.64	31.37	33.51	31.52	33.37	31.66	33.23	31.81	46
47	34.37	32.05	34.23	32.20	34.09	32.35	33.95	32.50	47
48	35.10	32.74	34.96	32.89	34.82	33.04	34.67	33.19	48
49	35.84	33.42	35.69	33.57	35.54	33.73	35.40	33.88	49
50	36.57	34.10	36.42	34.26	36.27	34.42	36.12	34.58	50
51	37.30	34.78	37.15	34.94	36.99	35.11	36.84	35.27	51
52	38.03	35.46	37.88	35.63	37.72	35.79	37.56	35.96	52
53	38.76	36.15	38.60	36.31	38.44	36.48	38.29	36.65	53
54	39.49	36.83	39.33	37.00	39.17	37.17	39.01	37.34	54
55	40.22	37.51	40.06	37.69	39.90	37.86	39.73	38.03	55
56	40.96	38.19	40.79	38.37	40.62	38.55	40.45	38.72	56
57	41.69	38.87	41.52	39.06	41.35	39.24	41.17	39.42	57
58	42.42	39.56	42.25	39.74	42.07	39.92	41.90	40.11	58
59	43.15	40.24	42.97	40.43	42.80	40.61	42.62	40.80	59
60	43.88	40.92	43.70	41.11	43.52	41.30	43.34	41.49	60
61	44.61	41.60	44.43	41.80	44.25	41.99	44.06	42.18	61
62	45.34	42.28	45.16	42.48	44.97	42.68	44.79	42.87	62
63	46.08	42.97	45.89	43.17	45.70	43.37	45.51	43.57	63
64	46.81	43.65	46.62	43.85	46.42	44.05	46.23	44.26	64
65	47.54	44.33	47.34	44.54	47.15	44.74	46.95	44.95	65
66	48.27	45.01	48.07	45.22	47.87	45.43	47.68	45.64	66
67	49.00	45.69	48.80	45.91	48.60	46.12	48.40	46.33	67
68	49.73	46.38	49.53	46.59	49.33	46.81	49.12	47.02	68
69	50.46	47.06	50.26	47.28	50.05	47.50	49.84	47.71	69
70	51.19	47.74	50.99	47.96	50.78	48.18	50.57	48.41	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
	47° 0'		46° 45'		46° 30'		46° 15'		

Dist.	44° 0′		44° 15′		44° 30′		44° 45′		45°	Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat. *	
1	0.72	0.69	0.72	0.70	0.71	0.70	0.71	0.70	0.71	1
2	1.44	1.39	1.43	1.40	1.43	1.40	1.42	1.41	1.41	2
3	2.16	2.08	2.15	2.09	2.14	2.10	2.13	2.11	2.12	3
4	2.88	2.78	2.87	2.79	2.85	2.80	2.84	2.82	2.83	4
5	3.60	3.47	3.58	3.49	3.57	3.50	3.55	3.52	3.54	5
6	4.32	4.17	4.30	4.19	4.28	4.21	4.26	4.22	4.24	6
7	5.04	4.86	5.01	4.88	4.99	4.91	4.97	4.93	4.95	7
8	5.75	5.56	5.73	5.58	5.71	5.61	5.68	5.63	5.66	8
9	6.47	6.25	6.45	6.28	6.42	6.31	6.39	6.34	6.36	9
10	7.19	6.95	7.16	6.98	7.13	7.01	7.10	7.04	7.07	10
11	7.91	7.64	7.88	7.68	7.85	7.71	7.81	7.74	7.78	11
12	8.63	8.34	8.60	8.37	8.56	8.41	8.52	8.45	8.49	12
13	9.35	9.03	9.31	9.07	9.27	9.11	9.23	9.15	9.19	13
14	10.07	9.73	10.03	9.77	9.99	9.81	9.94	9.86	9.90	14
15	10.79	10.42	10.74	10.47	10.70	10.51	10.65	10.56	10.61	15
16	11.51	11.11	11.46	11.16	11.41	11.21	11.36	11.26	11.31	16
17	12.23	11.81	12.18	11.86	12.13	11.92	12.07	11.97	12.02	17
18	12.95	12.50	12.89	12.56	12.84	12.62	12.78	12.67	12.73	18
19	13.67	13.20	13.61	13.26	13.55	13.32	13.49	13.38	13.44	19
20	14.39	13.89	14.33	13.96	14.26	14.02	14.20	14.08	14.14	20
21	15.11	14.59	15.04	14.65	14.98	14.72	14.91	14.78	14.85	21
22	15.83	15.28	15.76	15.35	15.69	15.42	15.62	15.49	15.56	22
23	16.54	15.98	16.47	16.05	16.40	16.12	16.33	16.19	16.26	23
24	17.26	16.67	17.19	16.75	17.12	16.82	17.04	16.90	16.97	24
25	17.98	17.37	17.91	17.44	17.83	17.52	17.75	17.60	17.68	25
26	18.70	18.06	18.62	18.14	18.54	18.22	18.46	18.30	18.38	26
27	19.42	18.76	19.34	18.84	19.26	18.92	19.18	19.01	19.09	27
28	20.14	19.45	20.06	19.54	19.97	19.63	19.88	19.71	19.80	28
29	20.86	20.15	20.77	20.24	20.68	20.33	20.60	20.42	20.51	29
30	21.58	20.84	21.49	20.93	21.40	21.03	21.31	21.12	21.21	30
31	22.30	21.53	22.21	21.63	22.11	21.73	22.02	21.82	21.92	31
32	23.02	22.23	22.92	22.33	22.82	22.43	22.73	22.53	22.63	32
33	23.74	22.92	23.64	23.03	23.54	23.13	23.44	23.23	23.33	33
34	24.46	23.62	24.35	23.72	24.25	23.83	24.15	23.94	24.04	34
35	25.18	24.31	25.07	24.42	24.96	24.53	24.86	24.64	24.75	35
36	25.90	25.01	25.79	25.12	25.68	25.23	25.57	25.34	25.46	36
37	26.62	25.70	26.50	25.82	26.39	25.93	26.28	26.05	26.16	37
38	27.33	26.40	27.22	26.52	27.10	26.63	26.99	26.75	26.87	38
39	28.05	27.09	27.94	27.21	27.82	27.34	27.70	27.46	27.58	39
40	28.77	27.79	28.65	27.91	28.53	28.04	28.41	28.16	28.28	40
41	29.49	28.48	29.37	28.61	29.24	28.74	29.12	28.86	28.99	41
42	30.21	29.18	30.08	29.31	29.96	29.44	29.83	29.57	29.70	42
43	30.93	29.87	30.80	30.00	30.67	30.14	30.54	30.27	30.41	43
44	31.65	30.57	31.52	30.70	31.38	30.84	31.25	30.98	31.11	44
45	32.37	31.26	32.23	31.40	32.10	31.54	31.96	31.68	31.82	45
46	33.09	31.95	32.95	32.10	32.81	32.24	32.67	32.38	32.53	46
47	33.81	32.65	33.67	32.80	33.52	32.94	33.38	33.09	33.23	47
48	34.53	33.34	34.38	33.49	34.24	33.64	34.09	33.79	33.94	48
49	35.25	34.04	35.10	34.19	34.95	34.34	34.80	34.50	34.65	49
50	35.97	34.73	36.82	34.89	35.66	35.05	35.51	35.20	35.36	50
51	36.69	35.43	36.53	35.59	36.38	35.76	36.22	35.90	36.06	51
52	37.40	36.12	37.25	36.29	37.09	36.45	36.93	36.61	36.77	52
53	38.12	36.82	37.96	36.98	37.80	37.15	37.64	37.31	37.47	53
54	38.84	37.51	38.68	37.68	38.52	37.85	38.35	38.02	38.18	54
55	39.56	38.21	39.40	38.38	39.23	38.55	39.06	38.72	38.89	55
56	40.28	38.90	40.11	39.08	39.94	39.25	39.77	39.42	39.60	56
57	41.01	39.60	40.83	39.17	40.66	39.95	40.48	40.13	40.30	57
58	41.72	40.29	41.55	40.47	41.37	40.65	41.19	40.83	41.01	58
59	42.44	40.98	42.26	41.17	42.08	41.35	41.90	41.54	41.72	59
60	43.16	41.68	42.98	41.87	42.79	42.05	42.61	42.24	42.43	60
61	43.88	42.37	43.69	42.57	43.51	42.76	43.32	42.94	43.13	61
62	44.60	43.07	44.41	43.26	44.22	43.46	44.03	43.65	43.84	62
63	45.32	43.76	45.13	43.96	44.93	44.16	44.74	44.35	44.55	63
64	46.04	44.46	45.84	44.66	45.65	44.86	45.45	45.06	45.25	64
65	46.75	45.15	46.56	45.36	46.36	45.56	46.16	45.76	45.96	65
66	47.47	45.85	47.28	46.05	47.07	46.26	46.87	46.46	46.67	66
67	48.20	46.54	47.99	46.75	47.79	46.96	47.58	47.17	47.38	67
68	48.91	47.24	48.71	47.45	48.50	47.66	48.29	47.87	48.08	68
69	49.63	47.93	49.43	48.15	49.21	48.36	49.00	48.58	48.79	69
70	50.35	48.63	50.14	48.85	49.93	49.06	49.71	49.28	49.50	70
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Dist.
	46° 0′		45° 45′		45° 30′		45° 15′		45°	

* The Dep. Column being the same as the Lat. it is omitted.

IV. A TABLE of NATURAL SINES, *calculated to five places of figures, for every Minute.*

NATURAL SINES are Decimals bearing the same proportion to Unity or 1 that the Sine of the corresponding number of Degrees and Minutes bears to Radius or Sine of 90°. That is, 1 is assumed as the Nat. Sine of 90°, and the Table calculated accordingly.

Explanation of the Table.

To find the Natural Sine of any number of Degrees and Minutes.

If the degrees be less than 45, look for them at the Top of the Columns, and for the Minutes at the left hand; but if more than 45, look for them at the Bottom, and for the Minutes at the Right hand; under or over the Degrees and against the Minutes will be the Natural Sine required.

The reverse of this will give the Degrees and Minutes corresponding to any Natural Sine.

To calculate the Northing or Southing, &c. for any Course and Distance, by Nat. Sines.

Find the Nat. Sine and Co-Sine of the Course, and into each of these multiply the Distance; the Products will be the Latitude and Departure required.

EXAMPLE.

Required the Latitude and Departure for 6 *Chains and* 22 *Links, on a Course N.* 38° 27′ *W.*

Nat. Sine of 38° 27',	0.62183	Nat. Co-Sine 0.78315
	6.22	6.22
	124366	156630
	124366	156630
	373098	469890
	3.8677826	4.8711930
Answer.	Northing 4.87	Westing 3.87.

	0 Deg.		1 Deg.		2 Deg.		3 Deg.		4 Deg.		
M	Nat. Sine	N.Co. Sine	Nat. Sine	N.Co Sine	Nat. Sine	N.Co-Sine	Nat. Sine	N.Co-Sine	Nat. Sine	N.Co-Sine	M
0	00000	Unit	01745	99985	03490	99939	05234	99863	06976	99756	60
1	29	00	774	84	519	38	263	61	07005	54	59
2	58	00	803	84	548	37	292	60	034	52	58
3	87	00	832	83	577	36	321	58	063	50	57
4	116	00	862	83	606	35	350	57	092	48	56
5	145	00	891	82	635	34	379	55	121	46	55
6	175	00	920	82	664	33	408	54	150	44	54
7	204	00	949	81	693	32	437	52	179	42	53
8	233	00	978	80	723	31	466	51	208	40	52
9	262	00	02007	80	752	30	495	49	237	38	51
10	291	00	036	79	731	29	524	47	266	36	50
11	320	99999	065	79	810	27	553	46	295	34	49
12	349	99	094	78	839	26	582	44	324	31	48
13	378	99	123	77	868	25	611	42	353	29	47
14	407	99	152	77	897	24	640	41	382	27	46
15	436	99	181	76	926	23	669	39	411	25	45
16	00465	99999	02211	99976	03955	99922	05698	99838	07440	99723	44
17	495	99	240	75	984	21	727	36	469	21	43
18	524	99	269	74	04013	19	756	34	498	19	42
19	553	98	298	74	042	18	785	33	527	16	41
20	582	98	327	73	071	17	814	31	556	14	40
21	611	98	356	72	100	16	844	29	585	12	39
22	640	98	385	72	129	15	873	27	614	10	38
23	669	98	414	71	159	13	902	26	643	08	37
24	698	98	443	70	188	12	931	24	672	05	36
25	727	97	472	69	217	11	960	22	701	03	35
26	756	97	501	69	246	10	989	21	730	01	34
27	785	97	530	68	275	09	06018	19	759	99699	33
28	814	97	560	67	304	07	047	17	788	96	32
29	844	96	589	66	333	06	076	15	817	94	31
30	873	96	618	66	362	05	105	13	846	92	30
31	00902	99996	02647	99965	04391	99904	06134	99812	07875	99689	29
32	931	96	676	64	420	02	163	10	904	87	28
33	960	95	705	63	449	01	192	08	933	85	27
34	989	95	734	63	478	00	221	06	962	83	26
35	01018	95	763	62	507	99898	250	04	991	80	25
36	047	95	792	61	536	97	279	03	08020	78	24
37	076	94	821	60	565	96	308	01	049	76	23
38	105	94	850	59	594	94	337	99799	078	73	22
39	134	94	879	59	623	93	366	97	107	71	21
40	164	93	908	58	653	92	395	95	136	68	20
41	193	93	938	57	682	90	424	93	165	66	19
42	222	93	967	56	711	89	453	92	194	64	18
43	251	92	996	55	740	88	482	90	223	61	17
44	280	92	03025	54	769	86	511	88	252	59	16
45	309	91	054	53	798	85	540	86	281	57	15
46	01338	99991	03083	99952	04827	99883	06569	99784	08310	99654	14
47	367	91	112	52	856	82	598	82	339	52	13
84	396	90	141	51	885	81	627	80	368	49	12
49	425	90	170	50	914	79	656	78	397	47	11
50	454	89	199	49	943	78	685	76	426	44	10
51	483	89	228	48	972	76	714	74	455	42	9
52	513	89	257	47	05001	75	743	72	484	39	8
53	542	88	286	46	030	73	773	70	513	37	7
54	571	88	316	45	059	72	802	68	542	35	6
55	600	87	345	44	088	70	831	66	571	32	5
56	629	87	374	43	117	69	860	64	600	30	4
57	658	86	403	42	146	67	889	62	629	27	3
58	687	86	432	41	175	66	918	60	658	25	2
59	716	85	461	40	205	64	947	58	687	22	1
M	N.Co-Sine	Nat. Sine	N.Co-Sine	Nat. Sine	N.Co-Sine	Nat. Sine	N.Co-Sine	Nat. Sine	N.Co-Sine	Nat. Sine	M
	89 Deg.		88 Deg.		87 Deg.		86 Deg.		85 Deg.		

M	5 Deg.		6 Deg.		7 Deg.		8 Deg.		9 Deg.		M
	N.S.	N.CS.	N. S.	N.CS.	N S.	N.CS.	N S.	N.CS.	N.S	N.CS.	
0	08716	99619	10453	99452	12187	99255	13917	99027	15643	98769	60
1	745	17	482	49	216	51	946	23	672	64	59
2	774	14	511	46	245	48	975	19	701	60	58
3	803	12	540	43	274	44	14004	15	730	55	57
4	831	09	569	40	302	40	033	11	758	51	56
5	860	07	597	37	331	37	061	06	787	46	55
6	889	04	626	34	360	33	090	02	816	41	54
7	918	02	655	31	389	30	119	98998	845	37	53
8	947	99599	684	28	418	26	148	94	873	32	52
9	976	96	713	24	447	22	177	90	902	28	51
10	09005	94	742	21	476	19	205	86	931	23	50
11	034	91	771	18	504	15	234	82	959	18	49
12	063	88	800	15	533	11	263	78	988	14	48
13	092	86	829	12	562	08	292	73	16017	09	47
14	121	83	858	09	591	04	320	69	046	04	46
15	150	80	887	06	620	00	349	65	074	00	45
16	09179	99578	10916	99402	12649	99197	14378	98961	16103	98695	44
17	208	75	945	99399	678	93	407	57	132	90	43
18	237	72	973	96	706	89	436	53	160	86	42
19	266	70	11002	93	735	86	464	48	189	81	41
20	295	67	031	90	764	82	493	44	218	76	40
21	324	64	060	86	793	78	522	40	246	71	39
22	353	62	089	83	822	75	551	36	275	67	38
23	382	59	118	80	851	71	580	31	304	62	37
24	411	56	147	77	880	67	608	27	333	57	36
25	440	53	176	74	908	63	637	23	361	52	35
26	469	51	205	70	937	60	666	19	390	48	34
27	498	48	234	67	966	56	695	14	419	43	33
28	527	45	263	64	995	52	723	10	447	38	32
29	556	42	291	60	13024	48	752	06	476	33	31
30	585	40	320	57	053	44	781	02	505	29	30
31	09614	99537	11349	99354	13081	99141	14810	98897	16533	98624	29
32	642	34	378	51	110	37	838	93	562	19	28
33	671	31	407	47	139	33	867	89	591	14	27
34	700	28	436	44	168	29	896	84	620	09	26
35	729	26	465	41	197	25	925	80	648	04	25
36	758	23	494	37	226	22	954	76	677	00	24
37	787	20	523	34	254	18	982	71	706	98595	23
38	816	17	552	31	283	14	15011	67	734	90	22
39	845	14	580	27	312	10	040	63	763	85	21
40	874	11	609	24	341	06	069	58	792	80	20
41	903	08	638	20	370	02	097	54	820	75	19
42	932	06	667	17	399	99098	126	49	849	70	18
43	961	03	696	14	427	94	155	45	878	65	17
44	990	00	725	10	456	91	184	41	906	61	16
45	10019	99497	754	07	485	87	212	36	935	56	15
46	10048	99494	11783	99303	13514	99083	15241	98832	16964	98551	14
47	077	91	812	00	543	79	270	27	992	46	13
48	106	88	840	99297	572	75	299	23	17021	41	12
49	135	85	869	93	600	71	327	18	050	36	11
50	164	82	898	90	629	67	356	14	078	31	10
51	192	79	927	86	658	63	385	09	107	26	9
52	221	76	956	83	687	59	414	05	136	21	8
53	250	73	985	79	716	55	442	00	164	16	7
54	279	70	12014	76	744	51	471	98796	193	11	6
55	308	67	043	72	773	47	500	91	222	06	5
56	337	64	071	69	802	43	529	87	250	01	4
57	366	61	100	65	831	39	557	82	279	98496	3
58	395	58	129	62	860	35	586	78	308	91	2
59	424	55	158	58	889	31	615	73	336	86	1
M	N.CS.	N S.	N.CS.	N. S	N.CS	N. S	N.CS.	N. S.	N.CS.	N S	M
	84 Deg.		83 Deg.		82 Deg.		81 Deg.		80 Deg.		

M	10 Deg.		11 Deg.		12 Deg.		13 Deg.		14 Deg.		M
	N. S	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	
0	17365	98481	19081	98163	20791	97815	22495	97437	24192	97030	60
1	393	76	109	57	820	809	523	430	220	023	59
2	422	71	138	52	848	803	552	424	249	015	58
3	451	66	167	46	877	797	580	417	277	008	57
4	479	61	195	40	905	791	608	411	305	001	56
5	508	55	224	35	933	784	637	404	333	96994	55
6	537	50	252	29	962	778	665	398	362	987	54
7	565	45	281	24	990	772	693	391	390	980	53
8	594	40	309	18	21019	766	722	384	418	973	52
9	623	35	338	12	047	760	750	378	446	966	51
10	651	30	366	07	076	754	778	371	474	959	50
11	680	25	395	01	104	748	807	365	503	952	49
12	703	20	423	98096	132	742	835	358	531	945	48
13	737	14	452	90	161	735	863	351	559	937	47
14	766	09	481	84	189	729	892	345	587	930	46
15	794	04	509	79	218	723	920	338	615	923	45
16	17823	98399	19538	98073	21246	97717	22948	97331	24644	96916	44
17	852	94	566	67	275	711	977	325	672	909	43
18	880	89	595	61	303	705	23005	318	700	902	42
19	909	83	623	56	331	698	033	311	728	894	41
20	937	78	652	50	360	692	062	304	756	887	40
21	966	73	680	44	388	686	090	298	784	880	39
22	995	68	709	39	417	680	118	291	813	873	38
23	18023	62	737	33	445	673	146	284	841	866	37
24	052	57	766	27	474	667	175	278	869	858	36
25	081	52	794	21	502	661	203	271	897	851	35
26	109	47	823	16	530	655	231	264	925	844	34
27	138	41	851	10	559	648	260	257	953	837	33
28	166	36	880	04	587	642	288	251	982	829	32
29	195	31	908	97998	616	636	316	244	25010	822	31
30	224	25	937	92	644	630	345	237	038	815	30
31	18252	98320	19965	97987	21672	97623	23373	97230	25066	96807	29
32	281	15	994	81	701	617	401	223	094	800	28
33	309	10	20022	75	729	611	429	217	122	793	27
34	338	04	051	69	758	604	458	210	151	786	26
35	367	98299	079	63	786	598	486	203	179	778	25
36	395	94	108	58	814	592	514	196	207	771	24
37	424	88	136	52	843	585	542	189	235	764	23
38	452	83	165	46	871	579	571	182	263	756	22
39	481	77	193	40	899	573	599	176	291	749	21
40	509	72	222	34	928	566	627	169	320	742	20
41	538	67	250	28	956	560	656	162	348	734	19
42	567	61	279	22	985	553	684	155	376	727	18
43	595	56	307	16	22013	547	712	148	404	719	17
44	624	50	336	10	041	541	740	141	432	712	16
45	652	45	364	05	070	534	769	134	460	705	15
46	18681	98240	20393	97899	22098	97528	23797	97127	25488	96697	14
47	710	34	421	93	126	521	825	120	516	690	13
48	738	29	450	87	155	515	853	113	545	682	12
49	767	23	478	81	183	508	882	106	573	675	11
50	795	18	507	75	212	502	910	100	601	667	10
51	824	12	535	69	240	496	938	093	629	660	9
52	852	07	563	63	268	489	966	086	657	653	8
53	881	01	592	57	297	483	995	079	685	645	7
54	910	98196	620	51	325	476	24023	072	713	638	6
55	938	90	649	45	353	470	051	065	741	630	5
56	967	85	677	39	382	463	079	058	769	623	4
57	995	79	706	33	410	457	108	051	798	615	3
58	19024	74	734	27	438	450	136	044	826	608	2
59	052	68	763	21	467	444	164	037	854	600	1
M	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	M
	79 Deg.		78 Deg.		77 Deg.		76 Deg.		75 Deg.		

M	15 Deg.		16 Deg.		17 Deg.		18 Deg.		19 Deg.		M
	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	
0	25882	96593	27564	96126	29237	95630	30902	95106	32557	94552	60
1	910	585	592	118	265	622	929	097	584	542	59
2	938	578	620	110	293	613	957	088	612	533	58
3	966	570	648	102	321	605	985	079	639	523	57
4	994	562	676	094	348	596	31012	070	667	514	56
5	26022	555	704	086	376	588	040	061	694	504	55
6	050	547	731	078	404	579	068	052	722	495	54
7	079	540	759	070	432	571	095	043	749	485	53
8	107	532	787	062	460	562	123	033	777	476	52
9	135	524	815	054	487	554	151	024	804	466	51
10	163	517	843	046	515	645	178	015	832	457	50
11	191	509	871	037	543	536	206	006	859	447	49
12	219	502	899	029	571	528	233	94997	887	438	48
13	247	494	927	021	599	519	261	988	914	428	47
14	275	486	955	013	626	511	289	979	942	418	46
15	303	479	983	005	654	502	316	970	969	409	45
16	26331	96471	28011	95997	29682	95493	31344	94961	32997	94399	44
17	359	463	039	989	710	485	372	952	33024	390	43
18	387	456	067	981	737	476	399	943	051	380	42
19	415	448	095	972	765	467	427	933	079	370	41
20	443	440	123	964	793	459	454	924	106	361	40
21	471	433	150	956	821	450	482	915	134	351	39
22	500	425	178	948	849	441	510	906	161	342	38
23	528	417	206	940	876	433	537	897	189	332	37
24	556	410	234	931	904	424	565	888	216	322	36
25	584	402	262	923	932	415	593	878	244	313	35
26	612	394	290	915	960	407	620	868	271	303	34
27	640	386	318	907	987	398	648	860	298	293	33
28	668	379	346	898	30015	389	675	851	326	284	32
29	696	371	374	890	043	380	703	842	353	274	31
30	724	363	402	882	071	372	730	832	381	264	30
31	26752	96355	28429	95874	30098	95363	31758	94823	33408	94254	29
32	780	347	457	865	126	354	786	814	436	245	23
33	808	340	485	857	154	345	813	805	463	235	27
34	836	332	513	849	182	337	841	795	490	225	26
35	864	324	541	841	209	328	868	786	518	215	25
36	892	316	569	832	237	319	896	777	545	206	24
37	920	308	597	824	265	310	923	768	573	196	23
38	948	301	625	816	292	301	951	758	600	186	22
39	976	293	652	807	320	293	979	749	627	176	21
40	27004	285	680	799	348	284	32006	740	655	167	20
41	032	277	708	791	376	275	034	730	682	157	19
42	060	269	736	782	403	266	061	721	710	147	18
43	038	261	764	774	431	257	089	712	737	137	17
44	116	253	792	766	459	248	116	702	764	127	16
45	144	246	820	757	486	240	144	693	792	118	15
46	27172	96238	28847	95749	30514	95231	32171	94684	33819	95108	14
47	200	230	875	740	542	222	199	674	846	098	13
48	228	222	903	732	570	213	227	665	874	088	12
49	256	214	931	724	597	204	254	656	901	078	11
50	234	206	959	715	625	195	282	646	929	068	10
51	312	198	987	707	653	186	309	637	956	058	9
52	340	190	29015	698	680	177	337	627	983	049	8
53	368	182	042	690	708	168	364	618	34011	039	7
54	396	174	070	631	736	159	392	609	038	029	6
55	424	166	098	673	763	150	419	599	065	019	5
56	452	158	126	664	791	142	447	590	093	009	4
57	480	150	154	656	819	133	474	580	120	93999	3
58	508	142	182	647	846	124	502	571	147	989	2
59	536	134	209	639	874	115	529	561	175	979	1
M	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S	M
	74 Deg.		73 Deg.		72 Deg.		71 Deg.		70 Deg.		

	20 Deg.		21 Deg.		22 Deg.		23 Deg.		24 Deg.		
M	N. S.	N.C.S	N. S.	N.CS.	N. S.	N.CS	N. S.	N.CS.	N. S.	N.CS.	M
0	34202	93969	35837	93358	37461	92718	39073	92050	40674	91355	60
1	229	959	864	348	488	707	100	039	700	343	59
2	257	949	891	337	515	697	127	028	727	331	58
3	284	939	918	327	542	686	153	016	753	319	57
4	311	929	945	316	569	675	180	005	780	307	56
5	339	919	973	306	595	664	207	91994	806	295	55
6	366	909	36000	295	622	653	234	982	833	283	54
7	393	899	027	285	649	642	260	971	860	272	53
8	421	889	054	274	676	631	287	959	886	260	52
9	448	879	081	264	703	620	314	948	913	248	51
10	475	869	108	253	730	609	341	936	939	236	50
11	503	859	135	243	757	598	367	925	966	224	49
12	530	849	162	232	784	587	394	914	992	212	48
13	557	839	190	222	811	576	421	902	41019	200	47
14	584	829	217	211	838	565	448	891	045	188	46
15	612	819	244	201	865	554	474	879	072	176	45
16	34639	93809	36271	93190	37892	92543	39501	91868	41098	91164	44
17	666	799	298	180	919	532	528	856	125	152	43
18	694	789	325	169	946	521	555	845	151	140	42
19	721	779	352	159	973	510	581	833	178	128	41
20	748	769	379	148	999	499	608	822	204	116	40
21	775	759	406	137	38026	488	635	810	231	104	39
22	803	748	434	127	053	477	661	799	257	092	38
23	830	738	461	116	080	466	688	787	284	080	37
24	857	728	488	106	107	455	715	775	310	068	36
25	884	718	515	095	134	444	741	764	337	056	35
26	911	708	542	084	161	432	768	752	363	044	34
27	939	698	569	074	188	421	795	741	390	032	33
28	966	688	596	063	215	410	822	729	416	020	32
29	993	677	623	052	241	399	848	718	443	008	31
30	35021	667	650	042	268	388	875	706	469	90996	30
31	35048	93657	36677	93031	38295	92377	39902	91694	41496	90984	29
32	075	647	704	020	322	366	928	683	522	972	28
33	102	637	731	010	349	355	955	671	549	960	27
34	130	626	758	92999	376	343	982	660	575	948	26
35	157	616	785	988	403	332	40008	648	602	936	25
36	183	606	812	978	430	321	035	636	628	924	24
37	211	596	839	967	456	310	062	625	655	911	23
38	239	585	867	956	483	299	088	613	681	899	22
39	266	575	894	945	510	287	115	601	707	887	21
40	293	565	921	935	537	276	141	590	734	875	20
41	320	555	948	924	564	265	168	578	760	863	19
42	347	544	975	913	591	254	195	566	787	851	18
43	375	534	37002	902	617	243	221	555	813	839	17
44	402	524	029	892	644	231	248	543	840	826	16
45	429	514	056	881	671	220	275	531	866	814	15
46	35456	93503	37083	92870	38698	92209	40301	91519	41892	90802	14
47	484	493	110	859	725	198	328	508	919	790	13
48	511	483	137	849	752	186	355	496	945	778	12
49	538	472	164	838	778	175	381	484	972	766	11
50	565	462	191	827	805	164	408	472	998	753	10
51	592	452	218	816	832	152	434	461	42024	741	9
52	619	441	245	805	859	141	461	449	051	729	8
53	647	431	272	794	886	130	488	437	077	717	7
54	674	420	299	784	912	119	514	425	104	704	6
55	701	410	326	773	939	107	541	414	130	692	5
56	728	400	353	762	966	096	567	402	156	680	4
57	755	389	380	751	993	085	594	390	183	668	3
58	782	379	407	740	39020	073	621	378	209	655	2
59	810	368	434	729	046	062	647	366	235	643	1
M	N CS.	N. S.	N.CS.	N. S	N CS.	N. S	N.CS.	N. S.	N.CS	N S.	M
	69 Deg.		68 Deg.		67 Deg.		66 Deg.		65 Deg.		

M	25 Deg.		26 Deg.		27 Deg.		28 Deg:		29 Deg.		M
	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS	N. S.	N.CS.	
0	42262	90631	43837	89879	45399	89101	46947	88295	48481	87462	60
1	288	618	863	867	425	087	973	281	506	448	59
2	315	606	889	854	451	074	999	267	532	434	58
3	341	594	916	841	477	061	47024	254	557	420	57
4	367	582	942	828	503	048	050	240	583	406	56
5	394	569	968	816	529	035	076	226	608	391	55
6	420	557	994	803	554	021	101	213	634	377	54
7	446	545	44020	790	580	008	127	199	659	363	53
8	473	532	046	777	606	88995	153	185	684	349	52
9	499	520	072	764	632	981	178	172	710	335	51
10	525	507	098	752	658	968	204	158	735	321	50
11	553	495	124	739	684	955	229	144	761	306	49
12	578	483	151	726	710	942	255	130	786	292	48
13	604	470	177	713	736	928	281	117	811	278	47
14	631	458	203	700	762	915	306	103	837	264	46
15	657	446	229	687	787	902	332	089	862	250	45
16	42683	90433	44255	89674	45813	88888	87358	48076	48888	87235	44
17	709	421	281	662	839	875	383	062	913	221	43
18	736	408	307	649	865	862	409	048	938	207	42
19	762	396	333	636	891	848	434	034	964	193	41
20	788	383	359	623	917	835	460	020	989	178	40
21	815	371	385	610	942	822	486	006	49014	164	39
22	841	358	411	597	968	808	511	87993	040	150	38
23	867	346	437	584	994	795	537	979	065	136	37
24	894	334	464	571	46020	782	562	965	090	121	36
25	920	321	490	558	046	768	588	951	116	107	35
26	946	309	516	545	072	755	614	937	141	093	34
27	972	296	542	532	097	741	639	923	166	079	33
28	999	284	568	519	123	728	665	909	192	064	32
29	43025	271	594	506	149	715	690	896	217	050	31
30	051	259	620	493	175	701	716	882	242	036	30
31	43077	90246	44646	89480	46201	88688	47741	87868	49268	87021	29
32	104	233	672	467	226	674	767	854	293	007	28
33	130	221	698	454	252	661	793	840	318	86993	27
34	156	208	724	441	278	647	818	826	344	978	26
35	182	196	750	428	304	634	844	812	369	964	25
36	209	183	776	415	330	620	869	798	394	949	24
37	235	171	802	402	355	607	895	784	419	935	23
38	261	158	828	389	381	593	920	770	445	921	22
39	287	146	854	376	407	580	946	756	470	906	21
40	313	133	880	363	433	566	971	743	495	892	20
41	340	120	906	350	458	553	997	729	521	878	19
42	366	108	932	337	484	539	48022	715	546	863	18
43	392	095	958	324	510	526	048	701	571	849	17
44	418	082	984	311	536	512	073	687	596	834	16
45	445	070	45010	298	561	499	099	673	622	820	15
46	43471	90057	45036	89285	46587	88485	48124	87659	49647	86805	14
47	497	045	062	272	613	472	150	645	672	791	13
48	523	032	088	259	639	458	175	631	697	777	12
49	549	019	114	245	664	445	201	617	723	762	11
50	575	007	140	232	690	431	226	603	748	748	10
51	602	89994	166	219	716	417	252	589	773	733	9
52	628	981	192	206	742	404	277	575	798	719	8
53	654	968	218	193	767	390	303	561	824	704	7
54	680	956	243	180	793	377	328	546	849	690	6
55	706	943	269	167	819	363	354	532	874	675	5
56	733	930	295	153	844	349	379	518	899	661	4
57	759	918	321	140	870	336	405	504	924	646	3
58	785	905	347	127	896	322	430	490	950	632	2
59	811	892	373	114	921	308	456	476	975	617	1
M	N.CS.	N. S.	N.CS	N. S.	N.CS.	N. S.	N.CS.	N. S	N.CS.	N. S.	M
	64 Deg.		63 Deg.		62 Deg.		61 Deg.		60 Deg.		

M	30 Deg.		31 Deg.		32 Deg.		33 Deg.		34 Deg.		M
	N. S	N CS.	N. S.	N CS.	N. S	N.CS.	N. S	N.CS	N. S.	N.CS.	
0	50000	86603	51504	85717	52992	84805	54464	83867	55919	82904	60
1	025	588	529	702	53017	789	488	851	943	887	59
2	050	573	554	687	041	774	513	835	968	871	58
3	076	559	579	672	066	759	537	819	992	855	57
4	101	544	604	657	091	743	561	804	56016	839	56
5	126	530	628	642	115	728	586	788	040	822	55
6	151	515	653	627	140	712	610	772	064	806	54
7	176	501	678	612	164	697	635	756	088	790	53
8	201	486	703	597	189	681	659	740	112	773	52
9	227	471	728	582	214	666	683	724	136	757	51
10	252	457	753	567	238	650	708	708	160	741	50
11	277	442	778	551	263	635	732	692	184	724	49
12	302	427	803	536	288	619	756	67	208	708	48
13	327	413	828	521	312	604	781	660	232	692	47
14	352	398	852	506	337	588	805	645	256	675	46
15	377	384	877	491	361	573	829	629	280	659	45
16	50403	86369	51902	85476	53386	84557	54854	83613	56305	82643	44
17	428	354	927	461	411	542	878	597	329	626	43
18	453	340	952	446	435	526	902	581	353	610	42
19	478	325	977	431	460	511	927	565	377	593	41
20	503	310	52002	416	484	495	951	549	401	577	40
21	528	295	026	401	509	480	975	533	425	561	39
22	553	281	051	385	534	464	999	517	449	544	38
23	578	266	076	370	558	448	55024	501	473	528	37
24	603	251	101	355	583	433	048	485	497	511	36
25	628	237	126	340	607	417	072	469	521	495	35
26	654	222	151	325	632	402	097	453	545	478	34
27	679	207	175	310	656	386	121	437	569	462	33
28	704	192	200	294	681	370	145	421	593	446	32
29	729	178	225	279	705	355	169	405	617	429	31
30	754	163	250	264	730	339	194	389	641	413	30
31	50779	86148	52275	85249	53754	84324	55218	83373	56665	82396	29
32	804	133	299	234	779	308	242	35	689	380	28
33	829	119	324	218	804	292	266	340	713	363	27
34	854	104	349	203	828	277	291	324	736	347	26
35	879	089	374	188	853	261	315	308	760	330	25
36	904	074	399	173	877	245	339	292	784	314	24
37	929	059	423	157	902	230	363	276	808	297	23
38	954	045	448	142	926	214	388	260	832	281	22
39	979	030	473	127	951	198	412	244	856	264	21
40	51004	015	498	112	975	182	436	228	880	248	20
41	029	000	522	096	54000	167	460	212	904	231	19
42	054	85985	547	081	024	151	484	195	928	214	18
43	079	970	572	066	049	135	509	179	952	198	17
44	104	956	597	051	073	120	533	163	976	181	16
45	129	941	621	035	097	104	557	147	57000	165	15
46	51154	85926	52646	85020	54122	84088	55581	83131	57024	82148	14
47	179	911	671	005	146	072	605	115	047	132	13
48	204	896	696	84989	171	057	630	098	071	115	12
49	229	881	720	974	195	041	654	082	095	098	11
50	254	866	745	959	220	025	678	066	119	082	10
51	279	851	770	943	244	009	702	050	143	065	9
52	304	836	794	928	269	83994	726	034	167	048	8
53	329	821	819	913	293	978	750	017	191	032	7
54	354	806	844	897	317	962	775	001	215	015	6
55	379	792	869	882	342	946	799	82985	238	81999	5
56	404	777	893	866	366	930	823	969	262	982	4
57	429	762	918	851	391	915	847	953	286	965	3
58	454	747	943	836	415	899	871	936	310	949	2
59	479	732	967	820	440	883	895	920	334	932	1
M	N.CS	N. S	N.Cs	N. S.	N.CS.	N. S	N.CS.	N. S.	N.CS.	N. S	M
	59 Deg.		58 Deg.		57 Deg.		56 Deg.		55 Deg.		

M	35 Deg.		36 Deg.		37 Deg.		38 Deg.		39 Deg.		M
	N. S.	N.CS.	N. S	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N CS.	
0	57358	81915	58779	80902	60182	79864	61566	78801	62932	77715	60
1	381	899	802	885	205	846	589	783	955	696	59
2	405	882	826	867	228	829	612	765	977	678	58
3	429	865	849	850	251	811	635	747	63000	660	57
4	453	848	873	833	274	793	658	729	022	641	56
5	477	832	896	816	298	776	681	711	045	623	55
6	501	815	920	799	321	758	704	694	068	605	54
7	524	798	943	782	344	741	726	676	090	586	53
8	548	782	967	765	367	723	749	658	113	568	52
9	572	765	990	748	390	706	772	640	135	550	51
10	596	748	59014	730	414	688	795	622	158	531	50
11	619	731	037	713	437	671	818	604	180	513	49
12	643	714	061	696	460	653	841	586	203	494	48
13	667	698	084	679	483	635	864	568	225	476	47
14	691	681	108	662	506	618	887	550	248	458	46
15	715	664	131	644	529	600	909	532	271	439	45
16	57738	81647	59154	80627	60553	79583	61932	78514	63293	77421	44
17	762	631	178	610	576	565	955	496	316	402	43
18	786	614	201	593	599	547	978	478	338	384	42
19	810	597	225	576	622	530	62001	460	361	366	41
20	833	580	248	558	645	512	024	442	383	347	40
21	857	563	272	541	668	494	046	424	406	329	39
22	881	546	295	524	691	477	069	405	428	310	38
23	904	530	318	507	714	459	092	387	451	292	37
24	928	513	342	489	738	441	115	369	473	273	36
25	952	496	365	472	761	424	138	351	496	255	35
26	976	479	389	455	784	406	160	333	518	236	34
27	999	462	412	438	807	388	183	315	540	218	33
28	58023	445	436	420	830	371	206	297	563	199	32
29	047	428	459	403	853	353	229	279	585	181	31
30	070	412	482	386	876	335	251	261	608	162	30
31	58094	81395	59506	80368	60899	79318	62274	78243	63630	77144	29
32	118	378	529	351	922	300	297	225	653	125	28
33	141	361	552	334	945	282	320	206	675	107	27
34	165	344	576	316	968	264	342	188	698	088	26
35	189	327	599	299	991	247	365	170	720	070	25
36	212	310	622	282	61015	229	388	152	742	051	24
37	236	293	646	264	038	211	411	134	765	033	23
38	260	276	669	247	061	193	433	116	787	014	22
39	283	259	693	230	084	176	456	098	810	76996	21
40	307	242	716	212	107	158	479	079	832	977	20
41	330	225	739	195	130	140	502	061	854	959	19
42	354	208	763	178	153	122	524	043	877	940	18
43	378	191	786	160	176	105	547	025	899	921	17
44	401	174	809	143	199	087	570	007	922	903	16
45	425	157	832	125	222	069	592	77988	944	884	15
46	58449	81140	59856	80108	61245	79051	62615	77970	63966	76866	14
47	472	123	879	091	268	033	638	952	989	847	13
48	496	106	902	073	291	015	660	934	64011	828	12
49	519	089	926	056	314	78998	683	916	033	810	11
50	543	072	949	038	337	980	706	897	056	791	10
51	567	055	972	021	360	962	728	879	078	772	9
52	590	038	995	003	383	944	751	861	100	754	8
53	614	021	60019	79986	406	926	774	843	123	735	7
54	637	004	042	968	429	908	796	824	145	717	6
55	661	80987	065	951	451	891	819	806	167	698	5
56	684	970	089	934	474	873	842	788	190	679	4
57	708	953	112	916	497	855	864	769	212	661	3
58	731	936	135	899	520	837	887	751	234	642	2
59	755	919	158	881	543	819	909	733	256	623	1
M	N C.	N. S.	N.CS	N. S.	N.CS	N. S.	N CS.	N. S.	N.CS	N. S	M
	54 Deg.		53 Deg.		52 Deg.		51 Deg.		50 Deg.		

M	40 Deg.		41 Deg.		42 Deg.		43 Deg.		44 Deg.		M
	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S	N.CS.	N. S.	N.CS.	
0	64279	76604	65606	75471	66913	74314	68200	73135	69466	71934	60
1	301	586	628	452	935	295	221	116	487	914	59
2	323	567	650	433	956	276	242	096	508	894	58
3	346	548	672	414	978	256	264	076	529	873	57
4	368	530	694	395	999	237	285	056	549	853	56
5	390	511	716	375	67021	217	306	036	570	833	55
6	412	492	738	356	043	198	327	016	591	813	54
7	435	473	759	337	064	178	349	72996	612	792	53
8	457	455	781	318	086	159	370	976	633	772	52
9	479	436	803	299	107	139	391	957	654	752	51
10	501	417	825	280	129	120	412	937	675	732	50
11	524	398	847	261	151	100	433	917	696	711	49
12	546	380	869	241	172	080	455	897	717	691	48
13	568	361	891	222	194	061	476	877	737	671	47
14	590	342	913	203	215	041	497	857	758	650	46
15	612	323	935	184	237	022	518	837	779	630	45
16	64635	76304	65956	75165	67258	74002	68539	72817	69800	71610	44
17	657	286	978	146	280	73983	561	797	821	590	43
18	679	267	66000	126	301	963	582	777	842	569	42
19	701	248	022	107	323	944	603	757	862	549	41
20	723	229	044	088	344	924	624	737	883	529	40
21	746	210	066	069	366	904	645	717	904	508	39
22	768	192	088	050	387	885	666	697	925	488	38
23	790	173	109	030	409	865	688	677	946	468	37
24	812	154	131	011	430	846	709	657	966	447	36
25	834	135	153	74992	452	826	730	637	987	427	35
26	856	116	175	973	473	806	751	617	70008	407	34
27	878	097	197	953	495	787	772	597	029	386	33
28	901	078	218	934	516	767	793	577	049	366	32
29	923	059	240	915	538	747	814	557	070	345	31
30	945	041	262	896	559	728	835	537	091	325	30
31	64967	76022	66284	74876	67580	73708	68857	72517	70112	71305	29
32	989	003	306	857	602	688	878	497	132	284	28
33	65011	75984	327	838	623	669	899	477	153	264	27
34	033	965	349	818	645	649	920	457	174	243	26
35	055	946	371	799	666	629	941	437	195	223	25
36	077	927	393	780	688	610	962	417	215	203	24
37	099	908	414	760	709	590	983	397	236	182	23
38	122	889	436	741	730	570	69004	377	257	162	22
39	144	870	458	722	752	551	025	357	277	141	21
40	166	851	480	703	773	531	046	337	298	121	20
41	188	832	501	683	795	511	067	317	319	100	19
42	210	813	523	664	816	491	088	297	339	080	18
43	232	794	545	644	837	472	109	277	360	059	17
44	254	775	566	625	859	452	130	257	381	039	16
45	276	756	588	606	880	432	151	236	401	019	15
46	65298	75738	66610	74586	67901	73412	69172	72216	70422	70998	14
47	320	719	632	567	923	393	193	196	443	978	13
48	342	699	653	548	944	373	214	176	463	957	12
49	364	680	675	528	965	353	235	156	484	937	11
50	386	661	697	509	987	333	256	136	505	916	10
51	408	642	718	489	68008	314	277	116	525	896	9
52	430	623	740	470	029	294	298	095	546	875	8
53	452	604	762	451	051	274	319	075	567	855	7
54	474	585	783	431	072	254	340	055	587	834	6
55	496	566	805	412	093	234	361	035	608	813	5
56	518	547	827	392	115	215	382	015	628	793	4
57	540	528	848	373	136	195	403	71995	649	772	3
58	562	509	870	353	157	175	424	974	670	752	2
59	584	490	891	334	179	155	445	954	690	731	1
60	314	913	471	606	200	135	466	934	711	711	0
M	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	N.CS.	N. S.	M
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